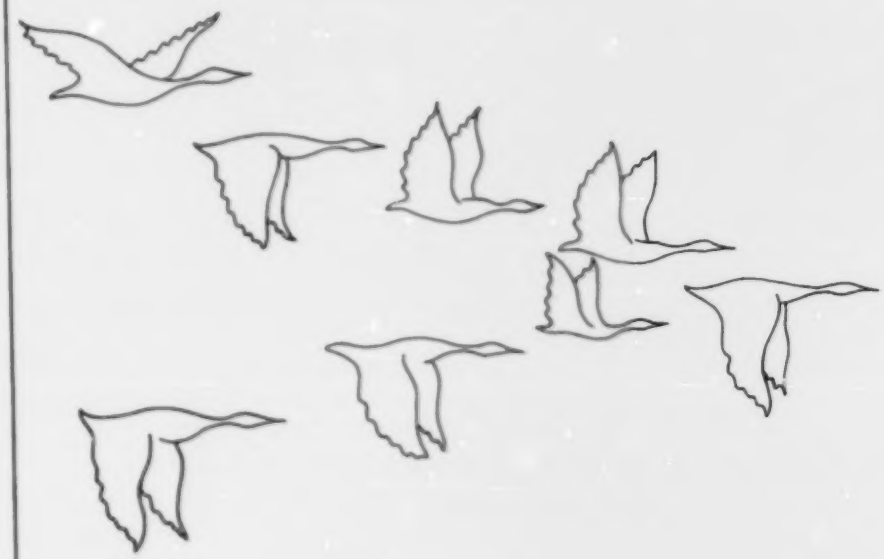
→ Sylvie Simmons

Annual Review 1988-1989



Canadian Wildlife Service

Canada

ANNUAL REVIEW

1988-89

Canadian Wildlife Service

Conservation and Protection

Environment Canada

THE CANADIAN WILDLIFE SERVICE

The Canadian Wildlife Service (CWS) is part of Conservation and Protection, Environment Canada.

The CWS is responsible for the protection and management of migratory birds through development of regulations, habitat management and supporting research and surveys. Together with the provincial and territorial governments the CWS undertakes research and resource management related programs related to wildlife where there is a national interest and advises other federal agencies on wildlife matters. The CWS also participates in international agreements and programs on wildlife conservation.

In June 1988 two new branches of the CWS were officially announced -- the Sustainable Development Branch and the State of the Environment Reporting Branch. These branches were created from the Lands Directorate and the Environmental Interpretation Division of Environmental Protection which were added to the CWS in January 1988.

As a consequence the CWS is now also responsible for promoting environmentally sustainable development and for reporting on the state of the health of Canada's environment.

Administratively, the CWS is organized into a headquarters office located in Hull, Québec and five regional offices:

- Atlantic Region (Sackville, New Brunswick)
- Quebec Region (Sainte-Foy, Québec)
- Ontario Region (Ottawa, Ontario)
- Western and Northern (Edmonton, Alberta)
- Pacific and Yukon (Delta, British Columbia)

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MIGRATORY BIRDS AND WILDLIFE CONSERVATION BRANCH

Migratory Birds Conservation

Waterfowl Populations

The situation for most North American duck populations was even worse in 1988-89 than during the past few years. The condition of prairie habitat further deteriorated in response to widespread drought. Production was fair in Quebec and the Maritime provinces, but was well below average in Western Canada. Restrictive hunting regulations remained in effect for 1988. Unless habitat conditions improve substantially in the spring of 1989, continental waterfowl populations can be expected to continue their decline.

Goose populations continued to increase as they have during recent years.

A framework was developed for annual migratory game bird regulations. The first set of annual migratory game bird status reports was produced and circulated for input from CWS regions, provincial/territorial wildlife agencies, and national non-government organizations. To provide population data for this effort, information from regional surveys of breeding waterfowl was accumulated, analysed for long- and short-term trends and stored as historical databases.

A database describing migratory game bird harvests since 1972 in current provincial hunting zones is under development and should be available for distribution in 1989. Other databases under development include a summary of harvest data in the US and long-term surveys of waterfowl wintering areas.

Non-game Birds

A database consisting of standardized names (English, French, scientific), taxonomic order, geographical ranges during breeding and wintering seasons and legal status for all Canadian species was initiated and is being prepared for distribution to the CWS regional offices.

The BIRDQUEST program introducing children to birdwatching was initiated and designed in cooperation with Canadian Nature Federation (CNF). BIRDQUEST will eventually be coordinated by CNF. The CWS is providing technical assistance during the developmental stage by determining the type of materials that should be covered, writing up suggestions for teaching and preparing regional checklists of birds.

Protocol to Amend the Migratory Birds Convention

A Protocol to amend the subsistence hunting provisions of the Migratory Birds Convention was signed by Canada and the US in 1979. However, it was not ratified by the US due to opposition from interest groups in Canada and the US A solution acceptable to all parties has been sought since.

Wildlife ministers discussed the issue at their meeting in September 1988. They instructed officials to continue exploring innovative approaches to the problem based on broad principles they set out. In February 1989, officials of Environment Canada and Justice Canada met to begin outlining legally feasible approaches to the problem. Once these legal options have been prepared, they will be put forward for discussion by stakeholders, including other government agencies and aboriginal groups. A preferred approach or approaches will be presented to wildlife ministers.

Latin American Program

The Latin American program funded eight cooperative projects in 1988-89. These were: a continuation of the Snow Geese study in central Mexico; an ecosystem study of wetlands in western Mexico; a study of Sandpipers in Panama in anticipation of the declaration of a Panamanian Western Hemispheric Shorebird Reserve; a study on the impact of agriculture on migratory forest birds in Belize (in conjunction with the US Fish and Wildlife Service); a study of the impact of man-made reservoirs on aquatic birds and their habitat in Brazil; a site inspection of protected areas in Suriname in preparation for the development of conservation management plans; implementation of Phase II of a bird banding training program in Cuba; and the presentation of migratory bird conservation seminars in Peru.

CWS successfully negotiated a memorandum of understanding for the conservation of migratory birds and their habitat with Mexico and began negotiations with Cuba and Peru for conservation agreements.

Legislation, Regulations and Enforcement

The Minister of Environment is responsible for protection of migratory birds throughout Canada. However the compliance and enforcement program since 1932 has been heavily dependent on the RCMP. The RCMP's Migratory Birds Section of 70 specially trained officers was the backbone of RCMP enforcement program. The section provided advice and coordination for enforcement throughout the country.

In May 1988, the RCMP disbanded the Migratory Birds Section leaving enforcement by the local RCMP detachments throughout Canada without central and expert enforcement guidance. As a consequence the CWS enforcement-coordination role has increased and will become more enforcement operations oriented than it has been.

Import and Export of Wild Animals and Plants Act

Preparation of an Act to control the import, export and interprovincial transport of wild animals and plants continued during 1988-89. Numerous discussions on the legislation were held with provincial and territorial wildlife agencies and other federal departments including Customs and Excise, RCMP, Agriculture, External Affairs and Fisheries and Oceans. At the end of the fiscal year, the consultation process was nearing an end and it is expected that the draft legislation will receive First Reading during the fall of 1989.

Habitat Management

The 30th Ramsar site, Malpeque Bay, Prince Edward Island, was deposited in IUCN's Conservation Monitoring Centre for inclusion in the List of Wetlands of International Importance in 1988. The area is a coastal estuary protected from storms by a long sandspit. It is a significant staging area for waterfowl during the fall and for shorebirds during late summer. The thirty Ramsar sites are located in all 10 provinces and both territories, covering about 130 000 square kilometres.

Approval for the establishment in 1989 of Prince Leopold Island, NWT, as a migratory bird sanctuary has been received from the communities of Resolute, Arctic Bay and Iqaluit (Frobisher Bay). Additional consultation in the communities of Pangnirtung and Broughton Island is required before Cape Searle and Reid Bay can be established as migratory bird sanctuaries.

The Area Advisory Committee for Polar Bear Pass NWT on Bathurst Island has prepared a draft management plan for the area. It will be distributed to interested parties for comments in 1989.

Eight additional properties have been acquired to complete Portobello as a National Wildlife Area in 1989.

Wetland mapping has been completed for all three Maritime provinces.

Negotiations to establish conservation agreements have been initiated. A pilot project on the island of Newfoundland is expected to be complete in early 1989. Québec region has initiated a wetland mapping program. The third and final year of the Prairie Habitat Monitoring Project will be completed in 1989; information generated will assist in the implementation of the Prairie Habitat Joint Venture of the North American Waterfowl Management Plan.

Provincial Crown lands in Saskatchewan in the area of Last Mountain Lake have been consolidated by the province in preparation for a transfer to the federal government in accordance with the agreement witnessed by Prince Philip in 1987. The area will be established as a national wildlife area under the Canada Wildlife Act in 1989.

Arctic National Wildlife Refuge--"1002" Lands Issue

In April 1987, the United States Department of the Interior recommended to the US Congress that lands in the Arctic National Wildlife Refuge designated under Section 1002 of the Alaska National Interest Lands Conservation Act be opened for petroleum exploration and development. These lands comprise valuable habitat for three important transboundary wildlife populations; the Porcupine caribou herd, polar bears and migrating Snow Geese.

Canada asked for consultations regarding the proposal, a request that resulted in meetings between the two countries in February and March 1987. Canada's position is that the risks of hydrocarbon development far outweigh the benefits and we urged that the US adopt a wilderness

designation of the 1002 lands. The wildlife in question is very important to northern people who depend on them for subsistence and as part of their cultural heritage.

Canada continued to monitor developments in the US Congress throughout 1988-89. CWS is in a good position to offer sound, scientifically-based advice on the Porcupine caribou herd, polar bears and Snow Geese.

Comprehensive Native Land Claims

CWS continued to play an active role in native land claims. The most significant achievement this this area in 1988-89 was the signing of the agreement in principle of the Dené-Métis comprehensive land claim by Prime Minister Mulroney in Rae-Edzo, NWT, September 4, 1988. It culminated five years of intensive negotiations. CWS contributed significantly to the "wildlife harvesting and management" clauses of the agreement.

As government geared up for land selections by the Dené-Métis, CWS-HQ, in cooperation with the western and northern region, drafted a memorandum to cabinet seeking additional resources to establish new conservation areas in the settlement area. These would protect key migratory bird habitats in an area where we have no national wildlife areas or migratory bird sanctuaries at present.

CWS participated in a working group to draft the subagreement on fish and "wildlife conservation and use for the Council of Yukon Indians land claim in 1988-89. Meanwhile negotiations on the Tungouk Federation of Nanaout land claim are proceeding apace, and talks have begun on the Labrador Inuit claim and the Conseil Attikamek-Montagnais claim of Québec.

CWS continues to be involved in the implementation of the Inuvialuit Final Agreement and the James Bay and Northern Québec Agreement.

Endangered Species

At the wildlife ministers' conference in September 1988, the Minister of the Environment and his colleagues established an organization and a strategy to deal with the recovery of endangered and threatened mammals, birds, reptiles and amphibians. This strategy will be known as RENEW (Recovery of Nationally Endangered Wildlife). A new organization, also called RENEW, will be established from the heads of all wildlife agencies in Canada and the three major national wildlife organizations. The strategy will involve recovery teams and recovery plans for each eligible species. The goal of RENEW is to enable its members to work as a team to preserve threatened and endangered species from extinction and to prevent vulnerable species from becoming threatened or endangered. The CWS will provide a permanent secretary to the RENEW Committee and has already provided the Committee with draft bylaws, a method of ranking species for management attention and a format for recovery plans. RENEW will hold its first meeting in June 1989.

In September 1988 the funding available for endangered species in Canada got a 25% boost when the Minister of the Environment signed an agreement with World Wildlife Fund Canada to create an Endangered Species Recovery Fund. Operating over the next four years, the fund will provide $2 million to non-government organizations for projects to recover threatened and endangered species.

The Department of the Environment is providing $1 million. Each successful applicant to the fund must provide $1 for every $2 received from the fund, thus stimulating the raising of funds for endangered species work from the private sector. The fund will be administered by World Wildlife Fund Canada, with two CWS members as part of a scientific advisory group making recommendations for funding to the World Wildlife Fund.

Convention on International Trade in Endangered Species of Wild Fauna and Flora

The years between biennial meetings of the Parties are normally quiet years and 1988 was no exception. International activities included the attendance of the Administrator at a number of North American and international meetings concerning Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The volume of correspondence received from the public increased over that of 1987 as did the number of telephone calls received by the two officers in the CITES office. The number of CITES permits issued by Canadian authorities increased slightly over 1987.

The Standing Committee of the Parties to CITES, of which Canada is a member, met once, in Costa Rica, January 25-31. The Canadian delegation to the meeting included the CWS and Department of External Affairs. The main topics of discussion included the implementation of Resolution Conf. 6.1, establishment of committees, the confidentiality of Standing Committee documentation, problems of the elephant ivory trade and the establishment of an African elephant working group.

In accordance with Conf. 6.1 Canada was asked to represent the North America region on the Animals Committee and to provide an interim chairperson of the Committee with responsibility for organizing the committee and setting it to work. Merlin Shoesmith, Government of Manitoba, agreed to be the Canadian representative. The United States agreed to represent the region on the Plants Committee. The Standing Committee asked Canada to chair a working group to review the operations of the CITES secretariat in accordance with Resolutions Conf. 6.1 and Conf. 6.2. Indonesia and the United Kingdom were appointed to join Canada as members of the working group.

The working group met in Lausanne, Switzerland, May 11-20, 1988. All aspects of the operations of the CITES secretariat were reviewed and all staff interviewed, including A.T. Brough of the UNEP Nairobi office. A comprehensive, confidential report, including 36 recommendations, was given to the chairman of the Standing Committee for distribution to Standing Committee members and the CITES Secretary General for review. The report was to be discussed at the Standing Committee meeting scheduled for Lausanne February 27 to March 3, 1989.

The Animals Committee, chaired on behalf of Canada by Dr. Shoesmith, met in Berne, Switzerland, November 7-11, 1988. The committee reviewed the biological status of a number of CITES species and allocated species that needed further review to individual committee members. The next meeting of the Animals Committee was to be held during April 1989. The Plants Committee met in London, England during November 1988. As the region is represented by the United States, Canada did not send a representative to the meeting.

Two North America region CITES meetings were held during 1988. The first, in Arlington, Virginia, USA, during April, was attended by CITES representatives from Canada, Mexico and the United States and the second, held in Halifax, Nova Scotia, during November, attended by CITES representatives from Canada and the US. Officers handling CITES matters in the federal departments of Fisheries and Oceans, Agriculture and External Affairs and in all provinces and territories were

invited to attend both meetings. Many accepted the invitations and joined the Canadian team. Both meetings dealt with minor CITES problems concerning shipments of live animals and products between Canada and the United States and with coordination between Canada and the US at CITES international biennial meetings.

The annual meeting of Canadian CITES management and scientific authorities was held in Halifax, Nova Scotia, November 16, 1988. The meeting was attended by a CITES team from CWS headquarters, representatives from most provinces and both territories, Fisheries and Oceans, Agriculture Canada, the RCMP and Canada Customs. The main thrust of the meeting was preparations for the 7th biennial Meeting of the Parties scheduled for October 1989. Only one species, the wood bison, was discussed; proposals are either for downgrading from Appendix I or for the Waterhen captive herd to be registered as an Appendix I captive breeding facility for commercial purposes. It was agreed that NWT and Manitoba would review the wood bison situation and, if it was decided to go ahead and propose downlisting or captive breeding registration, those agencies would prepare the appropriate proposal. As a follow-up to previous discussions with the United States, it was agreed that the CWS would coordinate preparation of a proposal for a CITES resolution establishing criteria for the registration of Appendix I captive breeding facilities for commercial purposes. At present, states registering captive breeding facilities follow their own guidelines, resulting in an international hodge podge of standards.

The Live Animals Board (LAB) of the International Air Transport Association (IATA) met three times during 1988, in Washington, D.C., USA., April 20-21, in Amsterdam, Netherlands, May 2-6 and in Montreal, November 7-11.

The CWS attended all LAB meetings in his capacity as chairman of the CITES International Transportation Working Group. The group is particularly concerned about the housing and care of wild animals in transit between countries. The Parties to CITES have adopted the IATA live animals regulations as CITES guidelines for the international movement of CITES specimens. The CWS was also represented at the annual meeting of the Animal Air Transport Association in Amsterdam, May 8-11 and the annual Canadian Association of Zoological Parks and Aquariums (CAZPA) board meeting in Hull, Québec April 22 and the CAZPA annual meeting in Moncton, New Brunswick, October 6-7.

As a result of a re-organization in CWS Headquarters during November 1988, the CITES section was moved from the Program, Marketing and Operational Services Branch to the Migratory Birds and Wildlife Conservation Branch effective December 1, 198[illegible]. The responsibilities and functions of the section are unchanged.

During 1988, the federal government issued 74 (62) import permits, 2231 (1844) export permits, 94 (87) transit certificates and 38 (40) scientific certificates. During the same period provincial and territorial government CITES authorities issued 3424 (3617) export permits (1987 figures are shown in brackets).

NORTH AMERICAN WATERFOWL MANAGEMENT PLAN

Introduction

In 1986, the Minister of Environment for Canada and the Secretary of the Interior for the United States signed the North American Waterfowl Management Plan (NAWMP). The Plan, with its fifteen-year horizon to 2000, establishes specific objectives to restore waterfowl populations and habitat. It is based on the central theme that conservation of waterfowl and its habitat require long-term planning and co-ordination of management activities in North America, co-operation and financial contributions from users of the resource, and scientific researching support of conservation measures.

Joint Ventures

During 1988-89, the NAWMP in Canada has shifted towards actual, on-the-ground work which progress towards the goals set out in the plan. This work is being organized under "joint ventures" which bring together government and private organizations who agree to work together in specific geographical areas. Two joint ventures are now actively being developed --the Prairie Habitat Joint Venture, andthe Eastern Habitat Joint Venture.

Eight First Step projects are now underway in eight provinces.

Under the Prairie Habitat Joint Venture they are:

- Buffalo Lakes (Alberta),
- Quill Lakes (Saskatchewan), and
- Minnedosa (Manitoba).

Under the Eastern Habitat Joint Venture they are:

- Matchedash (Ontario),
- Nicolet (Quebec),
- Grand Lake (New Brunswick),
- Grove Pine (P.E.I.) and
- Salt Marsh (Nova Scotia).

Implementation

Land is being purchased, habitat development is underway, and plans and material are being prepared for the coming (1989) field season. Communication Strategies and arrangements for project evaluation are also being prepared.

Implementation of the NAWMP, within CWS, has been separated out into a branch-level organization, headed by Acting Director who is reporting directly to the Director General. The NAWMP implementation is carried out in close collaboration with other branches at CWS Headquarters and with the Regional Offices.

Financial Committments

In 1988-89, the Canadian federal government committed $1.7 million, which was contributed in equal shares from Environment Canada, Agriculture Canada, and the Western Diversification Office. Based on approved plans for First-Step projects from both the Prairie and Eastern Habitat Joint Ventures, the money was distributed to the CWS regional offices. Over $400,000 was earmarked for land purchases, and the rest is going to habitat development, evaluation, legal fees, communications and other related activities. These funds, together with those contributed by the provinces, NGOs, and from U.S. sources, fulfill the approved First Step projects.

Agreements

At the federal level, agreements have been required at the Ministerial level (Order-in-Council) for land purchases and at the Deputy Minister level of operations. There have been bilateral agreements with implementing offices and NGOs, and multilateral agreements with Joint Venture partners to establish overall responsibilities and terms of reference. In September 1988, the Minister of the Environment signed two agreements to initiate waterfowl habitat enhancement projects in Canada under the NAWMP. The first was the Quill Lakes Project Agreement, part of the Prairie Habitat Joint Venture, which sets aside important wetlands and uplands in southern Saskatchewan at a cost of $6 million. The second was a Letter of Intent with Wildlife Ministers from Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland, and Ducks Unlimited Canada and Wildlife Habitat Canada to protect wetlands in central and eastern Canada.

Planning

Plans are now in various stages of development. There are, for example, First Step Plans, Second Step Plans, Five Year Plans, Fifteen Year Plans, Individual Project Plans, Communications Plans, And Evaluation Plans. Some of these are for approval for Advisory Boards and Committees, others for the guidance of the individual project implementation teams. Fifteen-year plans set out broader objectives, and will be revised and updated at five-year intervals. The implementation takes place through national, flyway, provincial, territorial, state, program and project plans which will set out the specific management details required.

The Prairie Habitat Joint Venture Agreement has completed drafting and is being prepared for the signature of the Minister in March. The milestone date for signing the Eastern Habitat Joint Venture Agreement in April, 1989.

The Pacific and Yukon Region of CWS is preparing a proposal for a Pacific Joint Venture. It is hoped that a PJV, working together with Pacific Northwestern States and Alaska, can create the first truly international joint venture.

The Black Duck and Arctic Goose Joint Ventures are also underway in implementing the NAWMP. A prospectus for the Black Duck Joint Venture has been developed, setting forth three priorities: (1) breeding surveys in Eastern North America, (2) banding of ducks, and (3) habitat research in support of the Eastern Habitat Joint Venture. Under the Arctic Goose Joint Venture, a prospectus for future monitoring and research is being developed.

Partnerships

Particularly in western Canada, the support of the agricultural community is required to achieve the goals of NAWMP. Cooperation and liaison with Agriculture Canada has been well established during the year. There are several areas of joint interest between agricultural programs and the NAWMP goals and objectives. These are primarily the Soil Conservation Program (Permanent Cover Program), and the Crop Insurance Program (Waterfowl Damage Compensation and Prevention). These Programs are being enhanced by NAWMP, and are being planned together with NAWMP to achieve both wildlife goals and agricultural goals.

Conclusion

They key present concern of the NAWMP is the confirmation of long-term federal commitments to the implementation of the Plan in Canada. Implementation is carried out through a partnership of governments, private sector organizations and individuals. The achievement of the environmental goals and the socio-economic goals through the partnership process will result in both the waterfowl resources and the associated land resources being developed, used, and conserved in a manner which will support their long-term sustainability. The NAWMP can thus demonstrate environment/economy integration and sustainable development in action in Canada.

WILDLIFE TOXICOLOGY AND SURVEYS BRANCH, NATIONAL WILDLIFE RESEARCH CENTRE

Migratory Bird Surveys

Migratory game bird hunting permit sales continued to decline. Only 322 000 permits were sold this year, compared to 342 000 for the 1987-88 hunting season. Nevertheless, a slight increase was noted in Québec and in the Maritimes. The national harvest survey selected 39 000 permit holders to receive a questionnaire. A further 24 000 permit holders were selected for the species composition survey. The national wing bee was held at the CWS Pacific and Yukon regional office. The wing receipts were down this year. Results on these surveys will be available in May 1989.

A special hunter opinion survey was sent to 6000 permit holders in Newfoundland for the first time this year. This joint project between the CWS Atlantic Region and CWS Headquarters is aimed at improving migratory bird management in the province.

The Bird Banding Office distributed 558 permits (new and renewed) to banders across the country. The computerized banding schedules now distributed to banders, were revised to incorporate the new species coding scheme and eliminate the requirement for a note for file. Volume 1 of the bird banding techniques manual has been revised by the U.S. Fish and Wildlife Service and should be available in June 1989. Guidelines have been prepared for animal care committees concerning the new policy for the use of devices such as neck collars, patagial tags, radio transmitters and nasal saddles.

A review of the breeding bird survey is under way with the objective of improving coverage and producing an annual report for collaborators. This project is a collaboration between CWS Atlantic region and headquarters.

Migratory Bird Research

Field work on the population dynamics and breeding biology of Acient Murrelets was carried out at Reef Island, in the Queen Charlotte Islands, B.C., March 28 to June 18. More than 1000 adult Acient Murrelets and 1200 chicks were trapped and marked. Recoveries of birds marked in earlier years yielded a survival rate for breeding birds of only about 67%, much lower than is usual for seabirds. Continued work in 1989 should improve the reliability of this preliminary estimate. Banding of Cassin's Auklet was carried out and studies of the diving depth and food taken made by Alan Burger, University of Victoria, in collaboration with CWS. All this work will contribute to the assessment of the impact of offshore oil development in Hecate Strait.

A field program at Coats Island, in northern Hudson Bay, the fifth year of an eight-year population dynamics study, ran June 9 to August 18 and involved six people. Just under 3000 Thick-billed Murres were banded, including 2700 chicks, the highest annual total so far. D.G. Noble studied the behaviour of pre-breeding birds; he will use the results in an M.Sc. thesis at Queen's University. Routine data on attendance of adults at the colony, timing of breeding and chick food and growth were collected. Feeding and chick growth rates suggested that food was exceptionally abundant during the rearing period in 1988. Depth gauges were attached to 25 breeding birds and yielded excellent results on the depths reached while feeding and the proportion of time spent under water, which will be written up by D. Croll and A. Burger under contract. Field energy expenditure measurements, using doubly labelled water, are still being analysed.

Guidelines on safety in seabird research, dealing with such topics as the use of boats, climbing and polar bears, have been prepared.

The impact of climate warming on birds breeding in Canada has become a focal point for research, initially on geese and shorebirds in the Arctic. Though much more work remains to be done, preliminary assessments were given to two international workshops in Washington, D.C. and West Germany.

A review of the role of research in the management of waterfowl in North America was given to an international meeting in France in December 1988.

Field work on Rowley Island, in Foxe Basin, and on Bylot Island, both in the NWT, was continued in collaboration with scientists from three regions and from universities. The studies deal with population changes in relation to habitat quality and quantity and to the influence of summer weather and fluctuations in the numbers of predators on breeding success.

Long-range Transport of Airborne Pollutants (LRTAP)

Research continued on the impacts of long-range air pollution on wildlife. It is designed to provide an understanding of the mechanisms and magnitude of the effects of acidity on wildlife. The program is coordinated at the National Wildlife Research Centre (NWRC), with toxicological research at NWRC, and ecological research in Ontario and Atlantic regions.

Scientific advice on the impacts of acid precipitation on wildlife is provided to the public and to intergovernmental committees. Efforts were begun in 1988-89 on the production of a joint federal-provincial LRTAP assessment document, due out in 1990. Interaction with international scientists in the LRTAP field continued; CWS scientists met their U.S. counterparts in Washington to exchange

information on the effects of dietary metals on bird reproduction, a potential problem for birds that breed in acidified environments.

We began the construction of a model to describe the effects of acid precipitation on waterfowl in eastern Canada. Data collected by CWS Ontario region in two areas of Northern Ontario showed that waterfowl often breed on very small wetlands that have generally not been included in past acidification models, and yet can be very sensitive to acidification. Lake size, presence or absence of fish, and lake pH are factors that influence the probability of finding pairs and broods of waterfowl on individual lakes. Fish-eating birds are much more likely to produce broods on lakes with pH above 6.0 than on more acidic lakes. For insectivorous waterfowl, there is some evidence that wetlands with pH less than 5.0 produce the fewest ducklings. Marked waterfowl are being used in research in Ontario region into these mechanisms.

Experiments continued into the association between lake acidity and metal uptake by birds, and its toxicological consequences. Dose-response studies with ring Doves supported the following conclusions.

- female birds accumulate substantially greater levels of some toxic metals than males
- accumulation of toxic metals is enhanced in males and females when dietary calcium is low (as in food from acidic environments)
- changes in dietary calcium affect metal accumulation more than similar changes in dietary phosphorus
- egg-laying ability or eggshell quality of Doves fed diets with low calcium (0.3%) but no added metals showed no obvious effects

Monitoring of waterfowl production was begun by Ontario and Atlantic regions in 1988, as part of the proposed National Integrated Monitoring Plan. All waterbodies in Kejimkujik National Park in Nova Scotia were surveyed, in addition to 237 wetlands in the Algoma region of Ontario. Plans for 1989 include expansion of the monitoring program to the Dorset region of Ontario.

An international workshop (Kejimkujik '89 Symposium), focusing on the integrated LRTAP program in Kejimkujik Park, was chaired by J. Kerekes (CWS-Atlantic) in October 1988. More than 50 papers were presented, including several from the CWS-Atlantic program on the chemical and biological effects of acid precipitation in Nova Scotia. Papers will be published as a proceedings in *Water, Air and Soil Pollution*.

Toxic Chemicals Evaluation and Monitoring

Pesticide Evaluation

CWS at NWRC continued to provide advice on the impacts of toxic chemicals on wildlife to various client agencies. Beside screening numerous applications for permits for pesticide research and new-product registration, major reviews of the following pesticides were produced: amitraz, arsenal, assert, assure, bayleton, cloethocarb, cyhalothrin, dimethipin, dimilin, fenoxaprop-ethyl, fluridone, fomesafen (updated), lentagran, refine. Discussion documents were prepared for hexazinone and 2,4-D. Special studies on aspects of avian reproduction were reviewed and finalized on vinclozolin and imazalil. Issues regarding regulatory status, discussions with Agriculture Canada and companies

continue with metsulfuron-methyl, carbofuran, diquat and hexazinone. Work was begun on microbial guidelines and non-target plant-testing guidelines.

The development of guidelines for testing pesticide toxicity to nontarget plants is progressing. A background report that examines the current plant-testing guidelines used in other countries, identifies Canadian expertise in phytotoxicity, evaluates test methods and data gaps was completed and approved for distribution for public comment. A comparison study to critically review plant-mediated impacts on wildlife from herbicides was initiated.

Agriculture Canada has accepted the CWS statement of concern that the insecticide carbofuran is an unnecessary and controllable hazard to birds and has agreed to a formal regulatory review of all its uses, a process targeted for completion by December 1990. Meanwhile, CWS is continuing to negotiate with Agriculture Canada for suitable interim measures to protect the Burrowing Owl, a threatened species in prairie Canada, from this insecticide. Carbofuran is very toxic to birds and has been shown to impair reproductive performance of Burrowing Owls.

The NWRC laboratories participated in the investigation of a number of kills thought to be related to pesticide use, including a kill of Canada Geese resulting from diazinon use on a golf course in Ontario, and a kill of Blackbirds and Sparrows resulting from carbofuran-treated rapeseed, also in Ontario. CWS intends to build up a bird-kill reporting network and investigative capacity in cooperation with other organizations.

The hazards of secondary poisoning of birds of prey such as Peregrine Falcons by fenthion insecticide was investigated in an experimental study contracted out to McGill University's MacDonald College. Fenthion is the active ingredient used in commercial Rid-a-Bird products, which are devices to eliminate unwanted perching of birds in and around buildings. American Kestrels and House Sparrows were used as the predator-prey model. The experiments demonstrated conclusively that not only do Kestrels readily die after feeding on House Sparrows exposed to the Rid-a-Bird perch, but, more significantly, that the Kestrels selectively prey on Sparrows weakened by exposure to fenthion.

The exposure of wildlife to pesticides following seeding operations in canola and cereal crops was investigated under contract by the Alberta Farm Machinery Institute. Insecticide granules and pesticide-coated seed, if not properly incorporated into the seedbed, present a readily available, highly concentrated toxic chemical source for wildlife, and many bird kills have been documented in North America. Variables found to affect incorporation efficiency included soil condition, double seeding and, very significantly, the type of seeding equipment used. Overall, the press drill exposed most surface seed and the hoe drill the least.

Further studies of the impact of agricultural pest-control practices on the Burrowing Owl were conducted this year. Considerable biological data on the owls were obtained and the hazard of gopher poisoning using strychnine-coated grain examined. Burrowing Owls were not significantly affected by this practice, as they kicked the treated grain out of their burrows and showed little interest in dead gophers and mice in the 48 hours following exposure. This research will be published, as will the completed technical report on the impact of carbofuran on the Burrowing Owl in Canada.

A pilot study tested using an agricultural bird census in Canada as a tool for:

- assessing the likely impacts on wildlife and their habitats from uses proposed for pesticides,
- monitoring changes in spatial distributions of species in population structure and numbers to evaluate the impacts of pesticides and other stress factors on the overall health of bird populations, and
- assessing impacts on wildlife and their habitats from use of specific pesticides.

The project focussed on birds in agricultural habitats in Saskatchewan. Contracts were let to design, in consultation with the project leaders, bird census and habitat sampling protocols, to conduct field work, to computerize and document the data and to compare the different census techniques. Breeding birds on 33 quarter sections of cropland were censused by two methods and the data computerized. The habitat on those quarter sections was mapped and computerized. A contract report has been submitted on the field procedures, databases and logistics for conducting a pilot ABC in Saskatchewan. Analysis of data will continue next year. The results will provide useful data for assessing potential risk to birds from use of agricultural pesticides in the prairies and for assessing the future of an ABC in Canada.

The work on two computer databases to allow for the systematic consideration of threatened and endangered species in the pesticide evaluation process was continued. The first database allows for the distribution of each species and the second contains information on the biology of each species. Data on several new species have been entered in 1988-89. The databases are also being used by State of the Environment Branch staff in their atlas, and will possibly be used by the National Atlas.

Contaminants Evaluation

A new Contaminants Evaluation Section was created to anticipate the need for more critical reviews of available data, monitoring and research on toxics-wildlife problems in support of the new Canadian Environmental Protection Act. The section will concentrate on assessment of priority substances, developing environmental quality objectives for wildlife, reporting on the chemical state of the wildlife environment and coordinating research and monitoring in NWRC and in the CWS regions. New resources for this section, the NWRC laboratories and the CWS regions to support CEPA were obtained and will be phased in over three years.

A growing concern about the quality of wild food (such as waterfowl) consumed by the public as well as by native groups prompted CWS to launch a national survey of contaminants in waterfowl. The objective of the survey is to provide a comprehensive database on contaminants in waterfowl to Health and Welfare Canada so that the risk of consumption to human health may be assessed, and consumption guidelines may be established if necessary. The first year of the survey began across Canada during the 1988 fall hunting season. It involved sampling of mainly herbivorous and omnivorous species (Mallards and Black Ducks) which are the most hunted species. In its second year (1989-90), the survey will sample primarily invertebrate and mollusc-eating and fish-eating waterfowl. Two manuscripts dealing with the use of wing parts for monitoring environmental residues and chemical residues, respectively, in Canadian Game Birds, are nearly finished. Both will be published as CWS technical reports.

A project to monitor levels of organochlorine contaminants in the blood of raptors migrating around the Great Lakes was continued for a third year. Results indicate ongoing exposure to a variety of pesticides, especially in species such as Sharp-shinned Hawks, Cooper's Hawks and Merlins which feed mainly on other birds and winter in the southern U.S. and Latin America. A progress report was written on this work. In a related study, eggs were collected from accipiter hawks in southern Ontario to determine OC levels and possible effects on breeding.

The monitoring of seabird contaminants continued with collection of the eggs and tissues of Atlantic coast seabirds. A survey was conducted to determine levels of heavy metals in tissues of those species. Articles on contaminant levels in seabirds from all three Canadian coasts were published in scientific journals.

Three articles were submitted to the journal Canadian Field Naturalist as part of a special edition to be edited by CWS scientists on the status of the Peregrine Falcon in Canada.

The submitted articles were on the following subjects:

- contaminants in Peregrine Falcons
- contaminants in prey species of Peregrine Falcons
- review of contaminants in Canadian birds of prey

Two technical reports on the second and third topics were also completed.

Some further work on a laboratory study into the chronic and acute toxicity of three PCB congeners to Japanese Quail and American Kestrels was completed to round out this project. Analysis and interpretation of the results of this work is well underway, and a number of manuscripts have been prepared.

A survey was conducted to determine the feasibility of collecting snapping turtle eggs for contaminant analyses near areas of industrial contamination. Associated with this project, a study was conducted to determine contaminant levels and their relationship to hatching success of turtles in four areas of southern Ontario.

A CWS representative presented a paper at a conference on environmental monitoring and specimen banking in Bayreuth, West Germany. At the conference, CWS was invited and agreed to host the next event in this international series of workshops in Ottawa in September 1989.

As part of the study of the effects of dioxins on the wildlife of south-western B.C., in cooperation with CWS P&Y Region, a CWS progress note was published on dioxin and furan levels and possible effects on Great Blue Herons. A paper on this work was also presented at SETAC 88. In addition, an article was accepted by a journal on contaminants in Great Blue Herons. NWRC scientists also participated in a one-day workshop at UBC on future directions for dioxin and wildlife research in B.C.

Laboratory Services

All toxic chemical residue analyses and related specimen banking and data management in CWS and its regional operations are performed centrally at NWRC.

The Laboratory Services Section processed a record 2100 wildlife specimens of which 70% were avian species. The greater part of these specimens were archived in the CWS national specimen bank. About 450 samples were analysed in the NWRC laboratories for organochlorine pesticides and PCBs in support of headquarter's and regional projects. About 800 other samples were submitted to provincial, university and private laboratories for a variety of metals and organochlorine/PCB analysis. The Laboratory Services Section has also cooperated with several other laboratories to verify their analytical performance.

The Section was involved with the following.

- analyses for organochlorine contamination in the Atlantic marine environment and for metals in seabirds from the Atlantic, Pacific and Arctic coasts
- analyses of domestic ducks as a measurement of bioaccumulation at various sites in Québec
- analyses of Herring Gull eggs, swallows, Kestrels and turtle eggs from around the Great Lakes
- archiving of samples of endangered species such as Piping Plovers and Peregrine Falcons
- determination of organochlorine residues in Great Blue Herons from British Columbia

- preparation of pooled samples and determination of contaminants in various species collected as wild food
- analytical support to determine the effects on wildlife of the PCB fire at St. Basil, Québec.

The CWS National Registry of Toxic Chemical residues has now been relocated to the NWRC from EMR. The registry is now being updated and rewritten in dBASE III to provide easier access. The computer network was again expanded and now includes more than 20 microcomputers. New analytical equipment was purchased to improve the data handling of organochlorine analyses. A project was commenced to convert older PCB residue data to that provided by specific congener analysis. Staff were trained to meet the requirements of the new Workplace Hazardous Materials Information System legislation.

Chemistry Research

Polychlorinated dibenzodioxins (PCDDs) and dibenzofurans (PCDFs) in fish-eating birds and other biota in the Strait of Georgia in British Columbia were the main focus in 1988-89. Analyses of PCDDs and PCDFs in samples from the intensive survey of Great Blue Herons, fish, crabs, bivalves and sediments in 1987 were completed. The conclusions that both bleached kraft mills and chlorophenol use contributed to PCDD and PCDF contamination in the Strait of Georgia were reported at the Ninth Dioxin Symposium at Umea, Sweden in August 1988. These data formed the core of a joint H&W-DFO-DOE assessment of potential impacts of dioxins in fish and shellfish in British Columbia on human health, which was released in May 1988. Several crab samples from the Prince Rupert area were also analysed for PCDDs and PCDFs as part of the interdepartmental emergency program on dioxins in fish and shellfish in the vicinity of bleached kraft mills, which resulted in the closure of shrimp and prawn fisheries in Howe Sound in British Columbia in January 1989.

Individual Great Blue Heron eggs (41) from three colonies in British Columbia with a known history and gradient of contamination were analysed for PCDDs and PCDFs as part of a cooperative study between CWS HQ, CWS P&Y and the University of British Columbia on the potential effects of these chemicals on reproduction and hepatic enzyme induction in this species. The results showed a significant correlation between ethoxyresorufin-Odeetheylase (EROD) activity in newly hatched chicks and 2,3,7,8-TCDD levels, but hatchability was not affected. It is still unclear whether the high levels of dioxins in British Columbia Great Blue Herons are connected with the failure of some colonies, especially the one at Crofton, to fledge young.

Pooled samples of Double-crested and Pelagic Cormorant eggs were surveyed from several areas in the Strait of Georgia, British Columbia. All samples showed chlorinated (especially hexachloro, HxCDD) PCDD contamination typical of that found in Great Blue Herons in this area. The highest HxCDD contamination in cormorants was found in Howe Sound and Crofton (near bleached kraft mills using chlorophenol contaminated wood chips) and the highest TCDD contamination was found in the Fraser estuary, downstream from several pulp mills in the Prince George and Quesnel areas. Shrews from Crofton were also shown to be contaminated, indicating that the terrestrial as well as the aquatic ecosystem is impacted by chlorophenols.

A method was developed and tested for determination of co-planar (toxic) PCBs in wildlife using an adaptation of the CWS carbon chromatography dioxin method. This minor sub-class of PCBs has been shown to exhibit dioxin-like toxicity in test animals and has been implicated in reproductive and teratogenic effects in fish-eating birds in the Great Lakes. Little is known about their distribution or

potential effects in wildlife. A survey of levels of toxic PCBs in fish-eating birds and other wildlife will be conducted in 1989-90 by applying this method to samples from the CWS National Specimen Bank.

A circumpolar survey of contaminants in Polar bears was planned, agreement was obtained for collecting samples from all areas of Canada, Alaska and Greenland in 1989-90 and samples may be obtained from Spitzbergen and the USSR.

Toxicology Research

The effects of oil on DNA degree of strand breaks, degree of methylation of DNA and occurrence of covalent adduct formation were examined for Herring Gulls and Puffins exposed to crude oil. An increase of strand breakage and decrease of methylation was found in birds exposed to oil. Benz(a)pyrene adducts were found at low concentrations in experimental birds. Herring Gulls from Lake Ontario had a decreased degree of methylation, but no difference in strand breaks from those from the Bay of Fundy. No benz(a)pyrene adducts could be detected.

Dr. Peakall has been appointed to chair the task force on Great Lakes reports on chemical pollution. Two technical reports (one on levels of toxic chemicals in the Great Lakes basin and another on effects of toxic chemicals on biota in the Great Lakes basin) and a synopsis report are to be produced by fall 1989. The second technical report will contain sections by Fisheries and Oceans, Health and Welfare and Environment Canada. The section on effects on wildlife species includes contributions from NWRC, Ontario region, CWS HQ and the Ontario Ministry of Natural Resources.

The Wildlife Toxicology Fund has been renewed. The new fund focuses more closely on the needs of CWS under the Pest Control Products Act, the new Environmental Protection Act and the LRTAP program. Environment Canada is providing $1 million over three years; additional core funds have been obtained from the Ontario and Québec governments and industry.

Attempts were made to develop a chicken liver cell culture technique to determine the relative toxicities of PCB congeners (as measured by porphyrogenicity and mixedfunction oxidase induction). The results of the project were encouraging and suggest that with some modification it will be sensitive enough to measure the porphyrogenicity and the mixedfunction oxidase potencies of extracts of environmental samples. Developmental work will continue into the second year of this project (1989-90).

Research to improve markedly the method for determining wild bird exposure to organophosphate pesticides was undertaken. The approach is to use biochemical microanalysis to detect organophosphate residues at the catalytic site of cholinesterase. Research will continue into the second year of this project (1989-90).

Brain and blood cholinesterase activities were determined in approximately 75 field-collected samples of birds in support of CWS regional projects and to seek the cause of field kills in cases where organophosphate or carbamate exposure was suspected.

STATE OF THE ENVIRONMENT REPORTING BRANCH

Introduction

In December 1986, the federal cabinet approved the federal environmental quality policy framework, which gave Environment Canada and Statistics Canada the authority and terms of reference to establish jointly a state-of-the-environment (SOE) reporting system. The Canadian Environmental Protection Act, passed into law in June 1988, gives SOE reporting its legislative mandate. Within Environment Canada, the Assistant Deputy Minister of Conservation and Protection (C&P) is responsible for the overall management of the department's role in the SOE reporting system. C&P's Canadian Wildlife Service assigned this task to the newly created SOE Reporting Branch in June 1988.

The SOE reporting program is designed to provide and communicate a comprehensive, systematic picture of environmental conditions and trends to a wide range of audiences in Canada. In assuming a lead role for the program, the SOE Reporting Branch:

- provides technical and scientific leadership and direction for SOE reporting;
- produces, co-ordinates, and advises on SOE reports and other products, including the 1991 national report;
- facilitates the contributions of other stakeholders to the SOE reporting system;
- provides the Environment Canada lead for SOE data management, including the link to Statistics Canada;
- advises Statistics Canada on SOE information system design, content, and organization, and assists Statistics Canada in SOE data selection;
- contributes to the development of SOE marketing strategies, including the production of a regular SOE newsletter; and
- provides technical, operational support for the SOE Public Advisory Committee.

Four divisions carry out the responsibilities of the branch, with a complement of approximately 40 PYs and an operating budget of around $1.2 million.

Strategies and Scientific Methods Division (SSMD)

SSMD provides leadership in the development of the SOE reporting program, including developing strategies and long-term action plans, and providing advice and recommendations to management on SOE reporting. A report (*Framework for SOE Reporting Operations*, Technical Report No. 1) was produced, which outlined the roles and responsibilities of the various actors in SOE reporting. Technical advice and support were provided to the SOE Public Advisory Committee, a departmental SOE planning workshop was organized in November 1988 with representatives from Environment Canada, CWS headquarters regions and Statistics Canada, and a five-year action plan for SOE reporting was developed. The division participated in six meetings with other government departments, three regional meetings and two provincial briefing sessions regarding SOE reporting.

SSMD provides a focal point for national and international efforts in SOE reporting research and development. The division coordinated the review of and provided additional data to an OECD environmental data compendium (1989), prepared a draft marine chapter for the OECD 1991 SOE report and responded to international requests for SOE information.

SSMD develops and promotes SOE reporting methods and techniques, including organizational and spatial frameworks, cross-sectoral analysis and environmental indicators. The report *Spatial Frameworks for SOE Reporting* (Technical Report No. 2) was produced. Under contracts, a report on the assessment of alternative organizational and spatial frameworks was completed and a conceptual report on the use of indicators of trends in sustainable development was completed. The St. Lawrence pilot study was initiated to demonstrate the use of an integrated, cross-sectoral approach to SOE reporting in co-operation with Centre St-Laurent. Under contract, literature on SOE indicators was reviewed. General SOE parameters for air and marine sectors have been identified.

SSMD is responsible for developing guidelines for, and assisting in, the selection of environmental data for SOE reporting. An SOE database inventory package for an SOE referral system was prepared and distributed within the department. A draft report on SOE indicator selection guidelines was completed, and a concept paper on environmental indicators was prepared.

SSMD is responsible for maintaining an issue-analysis capability and contributing to marketing strategies for SOE reporting. An inventory of analysis of environmental issues that warrant SOE reporting was completed, and a report providing an issue-analysis framework was drafted. One SOE newsletter was published, and a series of SOE briefing products were prepared, distributed and presented. The first SOE fact sheet was co-published.

Environmental Analyses and Reporting Division (EARD)

National Report

Every five years, a National SOE Report for Canada must be produced. In a significant departure from the first SOE report in 1986, which was produced by two main authors, the 1991 edition will be the result of widespread collaboration. Expertise throughout Environment Canada, other government departments, the provinces and territories, industry, academia and non-governmental groups has been solicited to involve major stakeholders in the preparation of a Canadian SOE report which is national in more than name.

An outline for the national report was completed in September 1988, after extensive consultations with Environment Canada services and regions, the Public Advisory Committee and others.

The report is divided into six sections, parts II to V being the core of the document. Responsibility centres (Environment Canada services or regions, other government departments, or outside consultants) have been identified to write the chapters in parts II (conditions and trends) and III (regional case studies). Work is now under way on these chapters. For most chapters, this involves developing an outline, identifying a production mechanism (e.g. in-house production, production by a multidisciplinary working group or external consultant etc.), collecting data, preparing a first draft, arranging for peer review and preparing the final draft. By March 1989, work on many chapters was at the data collection or first draft stage.

The production schedule for the national report calls for completion of chapters in parts II and III within the first half of 1989. Remaining chapters will be completed by summer 1990 with the editing, translation, cartography and printing to be completed before the report is tabled in Parliament by June 1991.

SOE Fact Sheets

This new series of 4–12 page Fact Sheets has been designed to highlight important environmental conditions or trends and to relate these changes to ecological conditions, economic opportunities, health risk and quality of life. These timely, attractive and informative reports are intended to stimulate interest in environmental concerns among the media, non-government organizations, high schools, libraries, politicians and the broad "interested environmental" audience.

The first SOE fact sheet, *Urbanization of Rural Land in Canada, 1981-86* (CWS HQ) was printed and two others, *Contaminants in Seabirds* (CWS HQ) and *Land Use in Canada* (CWS HQ), are well along in the production process. A number of cooperative ventures with services and regions has resulted in several additional products, such as *Pollutants in British Columbia's Marine Environment* (EP-P&Y), which is now being finalized.

Several Fact Sheets are also under consideration or in production in the regions and services: *Lower Fraser River Basin* (P&Y-B.C.), *Herring Gulls* (CWS-Ont.), and *Upper Great Lakes Connecting Channels* (Ont.). Discussions are ongoing with IWD and others as to participation in this fact sheet series.

SOE Report Series

The newly created Report Series will feature more detailed information and interpretation on a wide variety of environmental issues of national or regional significance. The audience intended is those who want a more thorough examination of the topic; it includes universities, resource managers, active NGOs etc. The SOE reports, like the Fact Sheets, will be free of charge.

The first SOE report, *Pollutants in British Columbia's Marine Environment* (EP-P&Y), has been printed. Five collaborative efforts are proceeding well through the review, editing, translation and printing stages:

- *Endangered Species in Canada* (CWS),
- *People and Parks* (CPS),
- *Contaminants in Seabirds* (CWS-HQ),
- *State of Air Quality* (CWS/HQ), and
- *State of Groundwater* (CWS-HQ and NHR-IWD).

A number of reports have been initiated in the regions and other services including:

- Lower Fraser River Basin (P&Y-B.C.) and
- Impacts of Global Change in Canada (AES).

Authors' Guidelines

Guidelines for authors and detailed technical specifications for the SOE Fact Sheets, Report Series, and Technical Series are being finalized and will be disseminated to all regions and services. Staff provide advice and other assistance to anyone interested in these SOE series.

Leadership in Promoting SOE Reporting

Staff made seven half-day presentations to other federal departments, provided technical and operational advice, as well as presentations at four Public Advisory Committee meetings (May, July [2], September), participated in the Interdepartmental SOE meeting and several SOE Working Group meetings and met with many Environment Canada services and regions.

Lastly, one SOE Newsletter (August 1988) was published and considerable input provided in the preparation of the SOE Brochure and drafts of the SOE Communications Strategy (with CPG).

Scientific and Technical Publications Division (STPD)

The Scientific and Technical Publications Division was involved in several new projects this year, including the premier issues of the *Ramsar Newsletter*, published on behalf of the Ramsar Convention Bureau in Switzerland. Editorial and production assistance was provided to the first SOE Fact Sheet (*Urbanization of Rural Land in Canada, 1981-86*) and report (*Pollutants in British Columbia's Marine Environment*), inaugurating two new series that are expected to grow over the years as state-of-the environment reporting is implemented. Another major milestone was the publication of the *Atlas of Nearctic Shorebirds on the Coast of North America*, which maps for the first time the critical wintering areas of many species of shorebirds.

In the established publications series, highlights include five new titles in the Hinterland Who's Who series (*Shorebirds*, *Common Eider*, *Murres*, *The Benefits of Wildlife*, and *Endangered Species in Canada*) and a second recovery plan (for the *anatum* Peregrine Falcon). As well, several Progress Notes, an Occasional Paper, seventeen Technical Reports, and regularly recurring items, such as the *Transactions of the Fifty-Third Federal- Provincial Wildlife Conference*, were published.

The division became a partner in an electronic publishing pilot project, which got under way in February and will test the feasibility of in-house typesetting and layout of publications.

Environmental Information Systems Division (EISD)

EISD has the lead role for Environment Canada in advising Statistics Canada on the design and format of the SOE database and referral system. The division is the documentation and control centre for departmental environmental data transferred to the SOE central database in Statistics Canada. EISD assesses processing equipments and determines optimal arrangements with data holders, authors

and Statistics Canada prior to data transfer to the SOE database. Geographic Information System (GIS) services are provided on a cost-recovery basis to the SOE reporting program, including the integration of selected environmental data to be transferred to the SOE database.

EISD researches and develops new and improved techniques and systems for environmental data management, analysis and modelling for SOE reporting. Informatics usage within CWS is coordinated in compliance with departmental standards and policies.

EISD has established a CWS Headquarters Informatics Planning Committee and produced a draft paper on cost recovery policy. Optical scanning and photo-plotting services have been provided to the Ontario Geological Survey and to the Geological Survey of Canada (Energy, Mines and Resources Canada). GIS advice and services were provided to the Food Agriculture Organization in Rome for databases of Africa, Asia and South America. PCB sites were located and location maps and models for planning were produced.

For the LRTAP program, databases of lake counts and measures were created using data from satellite imagery. The Federal Land Data Base was updated and SPANS databases were created.

Maps of species distribution were produced for the *Québec Bird Atlas*. For the Western and Northern Region, there is ongoing input related to Western Transects, and for the Historical Wetlands Prairie Database, present and historical trends in prairie wetlands were mapped and analysed.

With respect to the SPANS computer system, databases were downloaded, including CLI, ecodistricts, land use and national parks. A catalogue of available databases was completed, and an Environment Canada standing offer was negotiated with Supplies and Services for the purchase of SPANS software and training.

SUSTAINABLE DEVELOPMENT BRANCH

Introduction

In April 1987, the World Commission on Environment and Development (the Brundtland Commission) released its final report -- *Our Common Future*. This report stressed the necessity for humanity "to make development sustainable -- to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs". Similar recommendations emanated from other significant recent reports, including the *Report of the National Task Force on Environment and Economy* (submitted to the Canadian Council of Resource and Environment Ministers in September 1987), and the *World Conservation Strategy*, one of the principal objectives of which is "to ensure the sustainable utilization of species or ecosystems". Responding to the recommendations of these reports, Environment Canada in June 1988, created the Sustainable Development Branch which is within the Canadian Wildlife Service.

The Overall Goal

The overall goal of the Sustainable Development Branch is to promote environmentally sound development. Its main activities are to develop and assist the establishment of sustainable development policies and strategies, develop and facilitate the implementation of methods and tools to realize sustainable development, and provide information for integrated, environmentally sound development. To achieve this, the branch:

- coordinates the sustainable development initiatives of Conservation and Protection(C&P);
- leads in the development of a federal conservation strategy;
- develops policies and implementation guidelines to conserve exceptional Canadian wildlife habitat;
- conducts research to define better the link between sound development and a sustainable healthy environment;
- contributes to an integrated C&P response to impacts of climatic change on Canada's resources;
- strengthens and applies needed ecological and land use data on the quality and distribution of Canada's sustainable resources;
- implements the federal policy on land use;

- contributes to an integrated C&P acid-rain program with emphasis on research into the assessment and socio economic evaluation of national resources at risk from acid rain; and
- represents Environment Canada on federal land matters, reflecting environmental and sustainable land-use concerns, perspectives and obligations in advice and recommendations to Treasury Board and other federal departments and agencies.

Research and Other Initiatives Supporting Sustainable Development Implementation

Coordination of Conservation and Protection's Sustainable Development Program

Sustainable Development Branch establishes and coordinates the sustainable development program for Conservation and Protection. During 1988-89, a sustainable development coordinating committee was established in C&P with representation from all services. This committee developed an action plan for sustainable development to be implemented in Conservation and Protection. Among its achievements this committee agreed on a definition of sustainable development and its various components, developed procedures for building sustainable development into the programs of C&P and prepared an inventory of sustainable development activities within Conservation and Protection. The coordinating committee and its secretariat, housed in the Conservation Strategies and Development Division, made more than 40 presentations on sustainable development and implementation procedures to different parts of the department, other government departments, research institutes and non-government and private organizations involved in sustainable development. These activities have forged a continuing network that will advance sustainable development in the programs of the department and of other government departments.

Success Stories: Show Me, Don't Tell Me

The Success Stories project was begun in 1988-89. Its objective is to document success stories of sustainable development. These will help clarify the meaning of sustainable development, allow us to understand better what makes development sustainable and identify methods, procedures or examples that can be promoted and replicated. The program consists of a nation-wide inventory of success stories classified according to type, location, industrial sector and nature of benefit to the economy or the environment. Attached to each item in the inventory are documents that clarify the nature of the success, including contacts for still further information. A nation-wide network relating to success stories has been established, and the inventory currently contains close to 200 examples. Work will proceed in coming years to examine and document in greater detail many of the success stories and to provide written material to the public and researchers on the nature of sustainable development.

The Analysis and Development of Tools for Environment/ Economy Integration

This project aims to produce better means of measuring the value of the environment and of supporting decisions relating to the environment and the economy, and to demonstrate better to Canadians the value of their environment.

The major thrust of research was "Wetlands are not Wastelands", a collaborative project with Wildlife Habitat Canada, CWS regions, and Ryerson Polytechnical Institute to develop new means of evaluating wetland resources. In the past, conventional evaluation tools such as benefit-cost analysis have impeded effective decisionmaking when resources and the environment have been involved. This joint project aims to develop new evaluation methods and to test them with respect to threatened wetlands in different regions of Canada. Case studies in Greenock Swamp, Ontario, Minudie, Nova Scotia, and Cowichan, British Columbia were completed. A further pilot study in the Pothole areas of the Prairies is anticipated for the upcoming year. Based on the application of three methods to each of the areas (opportunity cost, willingness to pay and cumulative assessment), a workshop will develop new recommended methods for wetland evaluation, which will be published in a manual. An interim report was published in 1988 and three papers were presented at conferences.

Links Between Environmental Sustainability and Economic Development

This project aims to demonstrate to Canadians the relationship between the use and management of the environment and the level of economic development. To support this analysis, LANDBASE, a spatial information system containing economic and environmental information, has been maintained and expanded. This microcomputer-based system allows measurement of changes over time in relationships between such economic variables as production, jobs or land use to physical and biological variables relating to the environment (resource availability, climate etc.). Three major studies are underway:

- an analysis of trends in rural resource use and sustainability in Canada;
- an atlas of land-resource degradation in the prairie region (joint with SOE); and
- a fact sheet relating jobs in Canada, the province and sub-region to the environment and natural resources on which they are based. Work was also done on means of measuring and modelling sustainability and applying the concept to particular sectors.

Federal Program Impact

This project aims to assess the impact of various federal activities, programs and policies on the sustainability of the Canadian environment. Work continued on the master list of federal projects and programs with greatest potential to impact on the environment, including assessment of possible points of intervention or modification. Two research reports were completed to the manuscript stage -- an analysis of the impact of federal programs on Niagara fruitlands, and an analysis of the impact of federal policies and programs on resource planning and management in Renfrew County, Ontario. Both will be published in 1989-90.

The Sustainable Development Program in China

In fall 1988, a delegation from the Sustainable Development Branch, with participation from the SOE Reporting Branch and the University of Guelph, undertook a planning mission to China to aid in designing an environmental information system for that country's State Land Administration, which

manages most of the land of China. With more than 100 000 collecting information on the quality, use and tenure of lands, the administration has a serious problem of how to best use the information to support its planning and management process. The project aims to accomplish the technology transfer of environmental information systems. The Sustainable Development Branch maintains an advisory role in the further development of this major environmental information support system as a contribution to the sustainable development of China.

Habitat Conservation

An initial report demonstrating the need for a habitat strategy was tabled and discussed with CWS management at its June meeting in Victoria. Further discussions with CWS staff in Pacific & Yukon and Western & Northern regions were held in the fall, in preparation for continuing the project within the branch. A draft habitat strategy paper is anticipated by the fall, 1989.

Work on three cooperative pilot studies to examine alternative methods of valuating wetlands has been carried out for the Greenock Swamp (Ontario), Minudie (Nova Scotia) and Cowichan Estuary (British Columbia) areas, in conjunction with CWS regional staff and Wildlife Habitat Canada. A fourth study, for the prairie region, is being considered. These studies aim to provide evaluation tools that will better reflect the social and economic values of wetlands under threat of destruction or modification for other uses.

Work is also under way, in conjunction with an LRTAP project, to develop a habitat database from measurements of lakes in eastern Canada. As well, a project is being developed to facilitate the application of the Federal Lands Data Base towards CWS regional habitat initiatives on federal lands.

Habitat concerns were aired and incorporated into the CWS workshop on climatic change. International consultations were undertaken with conservation experts in Finland, (RAMSAR-IWRB) and the United States (Environmental Protection Agency). These consultations concerned the development of a national wetlands evaluation system and wetlands conservation initiatives, as well as RAMSAR Convention data system development.

Canada Committee on Ecological Land Classification (CCELC)

The Sustainable Development Branch provides a permanent secretariat for the CCELC. This national committee, which was formed in 1976, encourages the development of a uniform, national, ecological approach to the classification of land and natural ecosystem classification and the sound application of this approach to sustainable resource planning and management.

A major landmark publication, the *Wetlands of Canada*, was published in 1988. Prepared by the CCECL's national wetlands working group, the book involved more than 100 Canadian wetland specialists. It covers the influencing factors, distribution, evolution, classification, regionalization and methods for study of the wetlands of Canada.

Chapters are devoted to the wetlands of the Arctic, Subarctic, Boreal, Prairies, Eastern Temperate, Atlantic, and Pacific regions, as well as the salt marshes of Canada. A chapter also focuses on the sustainable use and conservation of wetlands in Canada.

The *Proceedings of Wetlands/Peatlands Symposium '87* were also published. This major international symposium, held in August 1987, was partly sponsored by the national wetlands working group.

The CCELC's ecoregions working group has finalized the map and report of the *Ecoclimatic Regions of Canada*. Ecoclimatic regions are typically broad areas with distinctive ecological responses to climate, as expressed by vegetation and reflected in soils, wildlife and water. In total, 72 ecoclimatic regions, organized within 10 ecoclimatic provinces, have been identified for Canada. *Ecoclimatic*

Regions of Canada will serve as a broad framework for many forms of sustainable resource decision-making.

The CCELC vegetation working group has finalized the first six levels of the Canadian Vegetation Classification System. This classification system will serve as a national standard for classifying vegetation during natural resource inventories, thereby contributing to a better understanding and hence better planning and management of resources. The Canadian Vegetation Classification System will be particularly useful in wildlife habitat inventory and management, impact assessments related to climatic change and acid rain, forest management and range management.

Perspectives on Land Modelling, was the proceedings of a CCELC-sponsored workshop, published by a national publisher. Comprised of twenty chapters, this publication deals with Canadian and American resource modelling issues such as resource planning and management, assessment of impacts of climatic change and acid rain and analysis of spatial and temporal characteristics of the sustainable resource base.

The branch also fostered the expansion of landscape ecology nationally through providing an interim secretariat for the Canadian Society for Landscape Ecology. The proceedings for a national symposium, *Landscape Ecology and Management*, were published through a national publisher The 30-plus papers included examine aspects of landscape ecology and management as practised in Canada.

Canadian Council on Ecological Areas (CCEA)

CWS provides secretariat services for CCEA, which continues to grow and to increase its level of activity. This has led to an increase in the services required. CCEA's greater activity is the result, in part, of holding annual meetings in different parts of Canada, thus stimulating regional participation and discussion. All activities -- especially those regarding exchange of information between governments, advice to governments, reporting on establishment of Canadian ecological areas and liaison with other national and international organizations interested in the protection of ecological areas -- contributed to furthering CCEA's objectives.

The CCEA annual meeting was held in Charlottetown, P.E.I., 19-21 August 1988. Representation included the federal government, nine provinces, one territory, three major Canadian NGOs and one American NGO. There was also substantial regional representation from Atlantic Canada. Major workshops were held which addressed research in ecological areas.

CCEA awards were presented as follows:

- Alberta Minister of Tourism, Donald Sparrow, was honoured for conservation achievements when he was Minister of Forestry, Lands and Wildlife.
- Vladimir Krajina was honoured for his contribution to the protection of ecologically significant areas in British Columbia.
- The Prince Edward Island Nature Trust was honoured for far-reaching conservation activities in that province.

Two editions of the *CCEA Newsletter* and the second report of the biennium were prepared, printed and distributed. These documents record CCEA's activities and achievements from both the contemporary and mid-term perspectives.

CCEA's first two occasional papers were printed; these papers deal with management and research guidelines and with decisionmaking for the establishment of ecological reserves.

Significant progress was made in the preparation of the national registry of ecological areas, with inputs from five jurisdictions. Information was computerized in preparation for printing.

The CCEA assisted in the development of a national wetlands policy through participation, by its chairman, in a major workshop of the national wetlands working group of the Canada Committee on Ecological Land Classification.

Relationships were strengthened with the Man and the Biosphere program, the Ontario Heritage Foundation, and the U.S. Natural Areas Association through periodic communication and the participation of appropriate directors in activities of these organizations. A session of the Natural Areas Association annual conference was organized by CCEA to highlight Canada, Canadian activities and the CCEA.

Contacts were established at major universities to promote the protection of ecological areas, research in these areas and participation in the CCEA.

Development and Application of National and Regional Databases in Support of Sustainable Development

Federal Land Data Base

The Federal Land Database was used extensively to identify federal facilities that could contain PCBs following the Saint-Basile-le Grand catastrophy in Quebec. It has also been used by the Department of Indian and Northern Affairs to assist Treasury Board's Area Screening Canada program. A pilot study is underway, in co-operation with Environmental Protection (Ontario region), to adapt and apply the FLDB in support of CEPA Part IV initiatives. Data derived from the FLDB files are also being used by the Canadian Parks Service in a Northern Manitoba study. Numerous public inquiries related to Crown lands have been addressed throughout the year.

Ecological Databases

Under contract, the national ecoregion database was validated, and preliminary descriptions of the physical and biological characteristics of each ecoregion were prepared. Also under contract, a preliminary map of the ecoprovinces of Canada was prepared, which will be refined in the 1989-90 fiscal year.

Canada Land Inventory

The Canada Land Inventory provided the first uniform, nation-wide measure of the country's terrestrial, renewable-resource wealth, covering all Canada's most-productive lands as well as those areas where conflicts and losses may arise. Areas of land are rated for their inherent capabilities for agriculture, forestry, wildlife-ungulates, wildlife-waterfowl and outdoor recreation.

In 1988, a 25th anniversary fact sheet on the CLI was published, and anniversary pins for participants in the program were distributed. With the sale of the millionth CLI map, a commemorative poster was produced, which was signed by all provincial and territorial representatives attending the 1988 meeting of the Canada Committee on Land Use.

Northern Information

The Northern Land Use Information Series of maps (scale 1:250 000) has developed into the major systematic, environmental, social research and information program for northern Canada. The infor-

mation presented in text and map form includes a wide range of environmental topics on wildlife, fish, resources, native land use, ecological land classification, and socio-economic data. Twelve map sheets for the central Baffin Island region were published, along with three background reports on renewable resources.

A series of Northern Perspectives maps, scale of 1:5 000 000, summarizes and portrays information on sustainable development in Canada's North. Most of this information has been gathered in the course of preparing the Northern Land Use Information Series maps. Maps printed in 1988-89 include: "Development and Potential of Selected Natural Resources in Canada's Northern Lands", threats to and opportunities for sustainable resources in the North, "Caribou of Canada's Northern Lands", identifying migration patterns and habitat locations and "Native Hunting and Trapping Areas in Canada's Northern Lands 1970-1985: An Overview" reflecting how natives rely on a sustainable resource base.

Environmental Issues Relating to Sustainable Development

Acid Rain

The Sustainable Development Branch's contributions to acid rain research are reported in this annual review in the chapter on long-range transport of airborne pollutants.

Climatic Change

Modelling the Environmental Implications of Climatic Change

The Sustainable Development Branch is working on terrestrial sensitivity models to assess the impacts of climatic change. The modelling work is based on the "Ecoclimatic Provinces of Canada", an ecological classification developed though the Ecoregions Working Group of the Canada Committee on Ecological Land Classification. The technique -- of modelling the information on ecoclimatic provinces through standard climate variables -- has not been used in this manner before.

Current scenarios use the results of the Goddard Institute for Space Studies (GISS). General Circulation Model (GCM) predicts a Canada that will be ecologically quite different from today. The implications of such widespread change are myriad and require further research.

Climatic Change Working Group

The climatic change working group of the Canada Committee on Ecological Land Classification was formed in December 1987. The working group is examining likely ecological responses to climatic change. Papers by the members of the working group formed the core of a CCELC newsletter that focused on concerns related to climatic change, including a global perspective, repercussions on Canada's ecological resources, impacts on forestry, societal implications etc. This newsletter has been distributed to more than 3000 people.

The interest in climatic change and in modelling the effects of the phenomenon have been high. There is growing concern and even frustration, however, that data, methods and tools are not yet available to address the question. In response to this, the climatic change working group will serve as a clearing house, collectively advising and disseminating information related to ecosystems.

Science and Operations Committee on Atmospheric Change (SOCAC)

CWS is represented on the C&P Science and Operations Committee on Atmospheric Change (SOCAC) by the director of the Sustainable Development Branch. In practice, the integrated programs coordinator attends. Membership consists of Inland Waters Directorate (chair, headquarters member, secretary, and representatives of the National Hydrological Research Institute and the National Water Research Institute), Environmental Protection, Policy Branch of C&P and CWS. The committee will serve as a focus for C&P climatic change activities, one of its first tasks being to coordinate C&P input to the Atmospheric Environment Service submission for new resources for climatic change and ozone depletion programs.

Saskatoon Workshop on Climatic Change

The workshop was held in the Prairie Migratory Bird Research Centre in Saskatoon, 1-2 February 1989, under the chairmanship of Tony Diamond. The workshop's objectives were to provide information that could contribute to a departmental submission on climatic change to Treasury Board and to identify areas that the Canadian Wildlife Service needs to be aware of and needs to react to, in order to fulfill its responsibilities of national and international wildlife conservation, including those under the Migratory Birds Convention.

All CWS regions and branches took part, including a healthy local contingent. Sustainable Development and SOE branch staff prepared background documents and made presentations on the implications of climatic change for Canada's wildlife, habitats and ecosystems.

Stimulating discussion in plenary session and working groups produced concrete proposals on the new and enhanced work that CWS should undertake in monitoring, research, assessment, impact modelling and wildlife conservation and management. The workshop provided the basis for Environment Canada's input to DOE's submission for new resources to address climatic change.

Marine Environment Quality

A preliminary report on CWS marine concerns is in preparation.

Management Tools For Facilitating Sustainable Development

Development of a Federal Conservation Strategy

The World Conservation Strategy (WCS) was produced in 1980 by the International Union for the Conservation of Nature and Natural Resources in cooperation with the United Nations Environment Program and the World Wildlife Fund. The strategy was to be a blueprint for the sustainable use of our global resources and the environment. It provides practical guidance for policy actions to manage our resources in a sustainable manner. The strategy has three objectives:

- to maintain essential ecological processes and life support systems;
- to preserve genetic diversity; and
- to ensure the sustainable use of species and ecosystems.

The WCS was formally endorsed by the Minister of the Environment on behalf of the federal government in October 1981. There have been since that time many conferences and achievements in support of the WCS. Currently, the Canadian Wildlife Service is leading the development of a federal

conservation strategy in response to the recommendation of the National Task Force on Environment and Economy that this be done by 1992.

The federal conservation strategy will be a federal plan for the wise use and management of resources and the environment. It will identify the actions necessary to achieve the long-term objective of environmentally sustainable development. An action plan to develop the federal conservation strategy and a paper describing what a federal conservation strategy means have been completed. Efforts have focused on establishing up-to-date information on where the provinces and territories are in their development of conservation strategies. Preparations are under way for a national workshop on conservation strategy development to be held May 17, 1989 as a pre-conference event to the Environment and Economy Partners for the Future Conference, in Winnipeg.

Federal Policy on Wetland Conservation

The federal policy on wetland conservation was initiated in 1988 by the Interdepartmental Committee on Land, which recognized a need to promote the sustainable use of wetlands in Canada. Although wetland use and conversion have contributed to economic development in Canada, continuing wetland loss and degradation are reaching critical levels. Therefore, it was recognized that a policy should be developed to ensure that wetlands are conserved and used in a sustainable manner. The Canadian Wildlife Service, under the direction of the Interdepartmental Committee on Land, is developing a federal policy on wetland conservation to promote the conservation of Canada's wetlands and thus sustain the ecological and socioeconomic functions of wetlands, now and in the future. The policy is currently in draft form and will soon undergo extensive consultation, along with a draft implementation plan.

Presentations on Canadian Wildlife Service wetland activities and on the policy were made at the conference Ontario Wetlands: Inertia or Momentum sponsored by the Federation of Ontario Naturalists.

Federal-Provincial Committee on Land Use

The Federal-Provincial Committee on Land Use (FPCLU) had its origins in 1974, when the federal government began to look at its influence on land use and consider either a national or federal policy on land. Following cabinet approval of the federal policy on land use, in 1980, the FPCLU was consolidated to liaise between the federal government and the provinces and territories with respect to land-use activities and the policy. Currently, the FPCLU meets annually and provides unique opportunities for information exchange and experience-sharing amongst provincial, territorial and federal officials with responsibilities in land-use planning and management. The FPCLU annual meeting was held in Ottawa, October 24-27, 1988 and was hosted by Environment Canada. Presentations were made to the committee on the North American waterfowl management plan, the federal policy on wetland conservation, conservation strategies, the Canadian Environmental Protection Act, and the federal environmental assessment and review process.

Federal Policy on Land Use

The federal policy on land use was approved by cabinet in 1980. The policy is designed to guide those activities of the federal government that affect the use and management of public and private land throughout the nation. To implement the policy, an interdepartmental committee on land was established which has representatives from 14 federal departments. This year, the committee produced its annual report for 1987-88, which highlights the committee's achievements. The committee also

produced a final draft of the report *The Federal Policy on Land Use Guidelines Manual: A Tool to Assist in implementing the Federal Policy on Land Use* and has initiated a casebook to demonstrate how guidelines can be applied in a specific program, project or policy. Work continues with the departments of Fisheries and Oceans and National Defence on integrating the policy guidelines into their departmental screening procedures.

Federal Land Management

The branch continued to represent the department on the Treasury Board Advisory Committee on Federal Land Management (TBAC/FLM), providing environmental and land-use advice on federal land transaction proposals, coordinating Area Screening Canada (ASC) study inputs, advising Treasury Board on its new federal land registry, and initiating a department-wide review of legislative and regulatory impact on federal lands and facilities. With the deputy minister's support, the branch successfully took the lead in resisting a Treasury Board attempt to charge departments for surplus federal lands received via interdepartmental transfer, using CWS's Boundary Bay transfer as a working example. Contributions to eight ASC studies were completed.

A new network of regional and headquarters contacts for the department's federal land management activities was established by the end of the year, to strengthen ties with regional screening and co-ordinating committees (or their equivalents). This action was prompted by Treasury Board's decision to continue the TBACFLM into the foreseeable future.

Building Environmental Criteria into Federal Economic Programs

One of the main operational achievements of the sustainable development program has been to build sustainable development into the business of federal departments and agencies. Cabinet approval of the document "Making the Environment Economy Partnership Work" has resulted in a mandate to build sustainable development review criteria into all federal-provincial economic agreements. Beginning with the Northwest Territories Economic Development Agreement, the Sustainable Development Branch has provided specific procedures, review criteria and inclusions to go into agreements and sub-agreements. Advice to Northwest Territories, the Atlantic region and Pacific and Yukon region with respect to the Yukon Economic Development Agreement has assisted significantly in making those agreements, and the projects under them, effective instruments of sustainable development. A concept paper, "Environment Economy Integration" has been produced and includes specific procedures for building sustainable development criteria into economic development agreements.

Environmental Impact Assessment

CWS activities in support of projects by agencies other than CWS are reported region by region. The Sustainable Development Branch coordinated CWS input to the *Initial Assessment Bulletin*.

Baseline Studies Fund (BSF)

The main feature of the administration of this fund in fiscal 1988-89 was a review by C&P and AES as to whether it should be managed differently, or indeed whether it should continue. The fund amounts to $165 000 allocated equally among C&P regional offices. C&P contributes $90 000 and AES $75 000. At the time of writing AES is still carrying out its review, and thus, the status of BSF for fiscal year 1989-90 is not known.

Socio-economic Insights and Advice

Socioeconomic insights are an important component of sustainable development. They contribute strategic knowledge on the demand for and the socio-economic benefits resulting from wildlife, habitat, and other renewable resources. These results are essential for the development and justification of federal, provincial and international conservation policies and programs required to sustain renewable resources and perpetuate their benefits. During 1988-89, socioeconomic contributions were made in the following key areas:

Federal-Provincial Survey on the Importance of Wildlife

The 1987 national survey on the importance of wildlife to Canadians, sponsored by the Federal-Provincial Wildlife Conference, was carried out by Statistics Canada between February and May 1988 under the direction of the Canadian Wildlife Service. CWS and all provinces contributed funding for the survey; new funding sources included the Department of Fisheries and Oceans, as well as the acid rain and the humane trapping programs. Survey results on wildlife-related recreation in 1987 were disseminated to sponsors. A federal-provincial task force has been created to oversee the analysis and publication of the results. The database will provide strategic socioeconomic insights to a wide range of federal, provincial and international wildlife and habitat policy and program management needs.

Insights from an earlier national survey continue to contribute socioeconomic perspectives to environmental management. For example:

- Demand for Wildlife to 2001 was published for the Federal-Provincial Wildlife Conference in June 1988 and is the fifth report from the 1981 database;
- The Benefits of Wildlife, part of CWS's Hinterland Who's Who series, highlighted socioeconomic impacts derived from the database in the context of the North American Waterfowl Management Plan and sustainable development initiatives;
- "Measuring the Demand for Non-Hunting Uses of Wildlife", a presentation to the Federal-Provincial Wildlife Conference in June 1988, used survey results to illustrate the emerging importance of managing for sustainable multiple wildlife use;
- A feasibility study is under way that will recast the database to enable statements on the socioeconomic benefits of wildlife-related recreation at risk from acidic deposition. This will be included in the forthcoming LRTAP national assessment.

International SocioEconomic Contributions

At the invitation of CIDA, CWS was involved in a special conservation mission to Harare in May 1989, with the objective of strengthening the political clout of the Ministry of National Resources and Tourism in the government of Zimbabwe. To accomplish this, a multi-million dollar project was designed to create a socioeconomic research and advisory capability in that ministry.

CWS delivered the keynote address at the opening plenary session of the International Symposium on Economic and Social Aspects of Wildlife in Mexico in May 1988, which attracted 400 people from four continents. CWS also organized and chaired a special socioeconomic session at that conference with participants from 11 countries. As a result of the above, the UNEP regional office for Latin America and the Caribbean invited CWS to draft a proposal to develop and apply socioeconomic databases and expertise to strengthen environmental administration policies and programs throughout Latin America and the Carribbean. Such a proposal has been prepared and will be discussed during an international meeting of government-nominated high-level experts on the environment in Brazilia in March-April 1989.

A joint project was initiated with the Wildbiologische Gesellschaft München to study wildlife-based tourism of Germans to Canada, *under the direction of CWS*. British Columbia, the Yukon and Northwest Territories generously provided access to hunting licence sales data, allowing a special survey. A report which will be prepared during 1989-90.

Resource Program Valuation and SocioEconomic Advice

Federal and provincial governmental expenditures on fish and wildlife management programs were collected and standardized to estimate their contribution to GDP, jobs and government revenue from taxes. More specifically, for every dollar spent on fish and wildlife management, 55 cents is returned to federal and provincial government coffers in tax revenues; for every $39 000 spent on management of the resources, one job is created. The results are found in a paper available from the Socioeconomic Division. Another economic analysis was prepared on the impact of expenditures on various sectors of the Canadian economy and main industries by the millions of Canadians who participate in wildlife-related activities. CWS's overall conclusion is that the taxes resulting from this economic force are more than five times greater than the amount spent by governments on fish and wildlife management programs.

These and a variety of other wildlife-related socioeconomic contributions were used in advising federal departments, provincial government agencies and NGOs on a wide number of conservation areas, including but not limited to the North American Waterfowl Management Plan, timber management, endangered species, state of the environment reporting, public attitudes on the environment, etc. Several key contributions to program and policy initiatives have been highlighted above. An additional example is a compilation of naturalists', conservation, and sportsmen's groups to which Canadians belong, which was prepared at the request of Barry Turner (a Member of Parliament at the time) to promote a new public fund for wildlife-related conservation projects upon which these NGOs could draw.

Marketing

The Sustainable Development Newsletter

In 1988-89, the former *Land* newsletter was transformed into a major communications vehicle for sustainable development. The *Sustainable Development* newsletter, reaching more than 8000 subscribers, has focused on sustainable development, including news on conservation strategies, round tables, federal-provincial and international progress toward sustainable development, success stories of sound management and environmental planning and regular updates on important events and documents relating to sustainable development. Originally serving the environmental planning and resource management community of Canada, the newsletter circulation has been expanded to serve wider interests concerned with sustainable development. More emphasis has been placed on the role of industry and non-governmental groups in achieving sustainable development.

Newsletters of the Canada Committee on Ecological Land Classification (CCELC)

The CCELC newsletter informs readers of significant developments in philosophy, methods and applications of ecological land classification and evaluation, with particular emphasis on the uses of

various kinds of natural resource data to address key issues and problems in environmental decision-making. The newsletter of the wildlife working group of the CCELC focuses more specifically on the wildlife component of ecological land classification and evaluation and on the contemporary issues and problems related to wildlife resource management and planning. The newsletters are distributed periodically to more than 2600 professionals, interest groups, academics and concerned individuals in Canada, the United States and many other countries throughout the world.

PROGRAM ANALYSIS AND COORDINATION BRANCH

Wildlife Minister's Conference

The Wildlife Minister's Conference, held on September 27 and 28, 1988.

The CWS was the focal point for the federal presence and contributed to the definition of the agenda. The branch briefed the DOE Minister by preparing his talking points and briefing notes. The items covered in the conference have required further action by CWS, as outlined below.

Recovery of Nationally Endangered Wildlife (RENEW)

An administrative committee including federal wildlife directors and national private conservation organizations is being established. Secretariat services are being provided by the CWS. Draft terms of reference for the steering committee are being prepared by the CWS. The first meeting will be held in June 1989.

North American Waterfowl Management Plan

The ministers endorsed implementation of First-step Projects and accepted proposals for a public awareness program and a that commitment be obtained from provinces involved for project funding.

The public awareness programs are the responsibility of the Joint Venture Groups, however CWS is preparing bi-monthly status reports for distribution. The ministers agreed to send a letter to the US Secretary of the Interior acknowledging the significance of the Canada/US partnership in the NAWMP and complimenting the US on its initiative to reduce the 1988 duck harvest. The CWS prepared such a letter for its Minister to forward through External Affairs.

Agriculture / Wildlife Interaction

There was consensus among the Ministers on the need to work closely with agriculture counterparts to co-ordinate and integrate resource management programs, especially on the prairies.

Waterfowl Protocol

The ministers agreed that a small group of wildlife deputy ministers would meet to discuss options to resolve the protocol issue well in advance of the next ministers' meeting. CWS has arranged that its deputy minister write to territorial deputy ministers outlining the waterfowl protocol and future steps to be taken. Independent legal review was also sought.

Habitat Coalition Request

The ministers agreed that a working group comprised of representatives of NGOs and government would meet to discuss the question and provide recommendations to the next Ministers Conference.

Fur Institute of Canada Proposals

The ministers agreed that a task force would be set up to review and recommend how to deal with the following Fur Institute's recommendations:

- Promotion of conservation, public education and trapper training
- Enhanced communication at the international political level

Co-operative Wildlife Research Institute

The ministers agreed that the wildlife directors would review the idea in greater detail, particularly the issue of funding, and would report at the next Wildlife Minister's Conference. Criteria for establishing Wildlife Research Centres have been prepared and distributed to wildlife directors by the CWS in fulfilment of CWS's coordination role.

Formation of the Wildlife Minister's Council

The ministers agreed that the Wildlife Ministers' Council of Canada (WMCC) would be formed to deal with national wildlife issues.

Program Planning

Program Activity Structure

A new CWS Program Activity Structure based on the Results Definition Model for Conservation and Protection was developed and served as the framework for program planning this year. The adoption of this system ensures that CWS programs are designed and assessed on the basis of desired results as defined by client needs.

Humane Trapping

In keeping with the five-year agreement between Environment Canada and the Fur Institute of Canada, $556 000 was provided over the past fiscal year for continued research and development of humane trapping systems. The International Fur Trade Federation provided $400 000 over the same period.

Research on killing-type traps continued at the Alberta Environmental Centre, concentrating on work with fisher and racoon. Field studies using the trap developed for mink were carried out on one trapline in Newfoundland and one in British Columbia during the fall and winter trapping season. Preliminary results indicate another successful development.

The FIC announced the success of the marten trap developed earlier by the six-person research team and called for interested manufacturers to pick up free plans and specifications. At the same time

250 of the prototype marten traps were distributed to 18 trappers in Northern Ontario to carry out field trials using the device as well as standard Conibear traps in different settings to assess efficiency. Results of these studies will be provided to the FIC in summer 1989.

Testing of traps for beaver in underwater sets continued at Washington State University, and results to date are being evaluated by the FIC's Research and Conservation Committee. This work will continue until December 1989.

Studies to evaluate the physiological and behaviourial responses of red foxes caught in various live-hold trapping systems continued. A report on the results of tests using the conventional steel leg-hold trap was submitted to FIC. It showed that certain stress indicators were higher than those for the padded foot trap, and trap-caused injuries were significantly higher. Similar data are being obtained for red foxes caught in live-hold cage traps.

Other field studies were carried out over the 1988-89 trapping season using a variety of live-hold devices for lynx and fox in the Yukon and Northern Ontario as well as monitoring the use of a killing-type snare for coyotes in Manitoba. In the NWT, field studies were undertaken to determine the efficiency of the use of killing-type traps compared with that of the conventional leghold traps in taking arctic fox. At the same time, video footage was obtained from a blind of foxes approaching different trap sets as a means of evaluating various animal-trap interactions. Results of all of the 1988-89 field studies will be provided to FIC during summer 1989.

The FIC convened an international symposium on trapping wild furbearers in Edmonton in mid-November. Invited delegates were trappers, wildlife biologists, representatives of animal welfare agencies, veterinary pathologists, fur retailers, trap manufacturers and government representatives, all with an interest in development of improved trapping systems.

Presentations were made by individuals from Britain, the Netherlands, Sweden, New Zealand, the US and Canada, outlining various research or trap-testing activities in their respective countries, either under programs to control predators or pests or for commercial trade. Proceedings of the symposium will be published by the FIC in early spring 1989.

Following the symposium the three working groups of Technical Committee 191 of the International Organization for Standardization (ISO) met to continue discussions on international trapping standards. The working groups are dealing individually with terminology, kill trapping and live hold trapping systems. Ultimately the working groups will draft a standard to be submitted to TC191 for review, approval and submission to the ISO Board.

CWS Research Strategy

Research was undertaken to develop a strategy for the future direction of wildlife scientific activities within CWS. This exercise considered the roles, responsibilities and priorities for wildlife research with provincial governments, universities and selected non-government organizations.

The objectives of the research strategy are to provide an overview of the nature and scope of current CWS scientific research, to situate this research in the context of our mandate and the activities of these other agencies and governments, and to recommend a strategy for the management and direction of future CWS research activities.

Meetings were held with representatives from all provincial and territorial governments, professors from universities in each region of Canada, and research managers in several national non-govern-

ment organizations. These meetings were complemented by extensive discussions with CWS regional directors and researchers in order to identify current priorities and future opportunities.

Preliminary results indicate that the CWS should move toward developing additional cooperative arrangements with other governments, agencies, and the public. These arrangements include mechanisms such as:

- using more volunteers in our surveys and monitoring activities
- extending our University Research Support Fund by involving Natural Sciences and Engineering Research Council
- proposing the establishment of Cooperative Wildlife Research Chairs/Centres at selected universities, and
- enhancing the partnerships and agreements with other departments and governments where possible

It is anticipated that recommendations from this Research Strategy will be considered by the CWS management committee, approved and implementation measures taken in the 1989-90 fiscal year.

International Coordination

In response to the growing need for global conservation action, CWS has begun an evaluation of its international activities, particularly those in Latin America. A working group of regional and headquarters staff has been formed. The working group expects to release its report by early 1990. The report will discuss current activities and recommend the future directions of CWS as they relate to international community.

CWS has recently signed a tri-partite memorandum of understanding with Mexico and the United States governments for the management of waterfowl. The Service is currently negotiating agreements with Cuba and Peru for wildlife and habitat-related activities.

CWS was successful in securing CIDA funding for World Wildlife Fund (Canada) to engage the services of a consultant who will draw up the management plan for the recently-declared Bigi-Pan Western Hemispheric Shorebird Reserve in Suriname.

On behalf of the international community, CWS has undertaken to coordinate the production of Ramsar Newsletter for the years 1988 to 1990.

Marketing

National Wildlife Week

The major single marketing activity was the National Wildlife Week activities in the National Capital Region. The CWS chaired the steering committee of about half a dozen government and non-government organizations (NGOs) which organized a full week of events.

The main venues were the National Museum of Natural Science and Carleton University. Exhibits by numerous NGOs and federal agencies were displayed at both locations. The major attraction at

Carleton University was the first International Wildlife Film Festival which featured the winning films of the 11th Annual Missoula International Film Festival.

Exhibits

The exhibit "Wildlife As Indicators of Environmental Quality" was displayed at the *Salon Éducation Science Technology* held at the Olympic Velodrome in Montreal. The presentation included display of a mounted specimen of a deformed Cormorant supplied by CWS Ontario Region and participation of CWS Quebec Region.

The CWS was invited by The Secretary of State to participate in their creation of the federal "Bravo Canada" exhibit at the Canadian National Exhibition. The CWS presentation featured the display of wild animals and wildlife interpretation presentations which focused on the theme of wetland conservation.

ATLANTIC REGION

Migratory Bird Population Monitoring and Surveys

Black Duck breeding pair surveys were conducted in all four provinces in 1988; all of these except PEI were helicopter surveys. Funding for the aerial surveys came through the Black Duck Joint Venture. The Newfoundland survey used 10 km x 10 km plots, rather than 5 km x 5 km plots used in NB and NS, to minimize the number on which no Black Ducks were found. The PEI ground surveys in spring and summer (four coverages) were continued for the sixth year, with collaboration by provincial wildlife personnel. The results indicate a stable to increasing breeding population in Nova Scotia and New Brunswick while a declining trend was suggested in Prince Edward Island.

Surveys for monitoring populations and harvesting of Woodcock were maintained. The spring singing-ground counts were coordinated with the U.S. Fish & Wildlife Service and provincial wildlife agencies, including Ontario. Efforts to assess harvest per unit effort were increased in 1988.

Waterfowl banding, with major support from the Atlantic Flyway Cooperative Banding Fund, continued, with over 3000 birds banded in 1988, including 1700 Black Ducks.

The new (1987) trapping method for migrating shorebirds resulted in 10 000 Sandpipers banded in 1988 – double the previous best year's catch. The new method is becoming popular among shorebird banders elsewhere.

A study to determine the impact of lead shot ingestion on Maritime waterfowl was initiated in 1988

Two projects were started under the Latin American Program. In Mexico, investigations were made on deterioration of coastal habitat used by Canadian-bred waterbirds and raptors. Assistance to Brazil was given to determine the impacts of hydro developments on aquatic communities.

A management strategy for the Newfoundland Murre harvest was drafted, and the public information program was continued in Newfoundland coastal communities.

Data collection and screening for the *Maritimes Breeding Bird Atlas* continued at an accelerated rate. Much effort is needed to keep up the volunteer effort and to ensure uniform coverage of remote areas. About 750 data cards comprising around 21 000 records were received in 1988 from nearly 300 observers.

The Maritimes Nest Records Scheme was coordinated and a report prepared and sent out to all contributors. Contributions were below average with 1054 cards received. The 94 cooperators were above the average number, but fewer observers in all provinces turned in fewer records than in 1987.

In support of an initiative by New Brunswick to model wildlife habitat supply under different forest management strategies, forest bird censusing was initiated in a number of different forest habitats. The

results will be used to ensure the maintenance of forest bird populations in New Brunswick forests, which are increasingly under more intensive management.

Research

The second year of a two-year study of Black Duck movements and mortality from fledging through to autumn migration was undertaken, using radio-telemetry, at the Shepody NWA, NB. Movements through August and September were minimal in both years, and losses in that period were mostly attributed to Great Horned Owls. Approximately 50% of radio-marked juvenile Black Ducks were killed by hunters in the first six weeks of the season (October 1 - November 15). Of that number, approximately a third were crippled and not retrieved. After autumn migration, radio-marked Black Ducks have been recovered in southern Nova Scotia, New Jersey and Massachusetts. Management strategies on the Shepody NWA will be implemented to reduce this high loss of Black Ducks to hunting, especially the loss to crippling and nonretrieval. In 1989-90 juvenile Black Ducks will be captured in forested and unmanaged wetland habitat in southwestern New Brunswick. Rates of dispersion and mortality will be compared to those for juveniles on the Shepody NWA.

A second year of study of the relative importance of coastal and inland habitats to breeding Black Ducks in Nova Scotia was carried out under contract by a university researcher, using Black Duck Joint Venture funding. The importance of coastal salt marshes to breeding and migrating Black Ducks is now being documented.

A study of Eider bioenergetics in the lower Bay of Fundy progressed well and is now in the final data analysis stage. Preliminary results indicate that winter habitat near St. Andrews, NB is the primary source of nutrients for spring egg production. The first field season of a related study of Eider-Gull interactions supports an earlier hypothesis that predation rates on Eider Ducklings by black-backed gulls is related to the presence or absence of winter herring stocks in the Quoddy Region of New Brunswick.

The initial phase of a computerized registry for seabird breeding colony data was completed. A description of the registry was presented at the Colonial Waterbird Conference in Washington, D.C.

Papers were published on the influence of ocean currents on distribution of Dovekies, Phalaropes and Storm Petrels. A draft seabird atlas was produced from aerial surveys to complement the published shipboard atlas. A model for simulating trends of Thick-billed Murre populations has been refined.

Bird Problem Mitigation

A draft Gull-management strategy for the Atlantic provinces was completed and distributed within Environment Canada for comments. It was necessary to consider some priority issues such as control of waste disposal sites before the strategy was completed.

Great Blue Heron predation at fish aquaculture sites and recreational fishing ponds was perceived to be an increasing problem.

The impacts of seaduck depredations on cultured mussel operations were investigated under contract. Included were visits to Scotland and Maine, where similar problems occur. Recommendations to reduce the losses will be suggested.

Regulations and Enforcement

A reduction in the numbers of RCMP officers necessitated a strategy to ensure their continuing support. All provincial divisions were asked to adopt a plan for Migratory Bird Convention Act enforcement in their areas.

Two term enforcement coordinators were retained in Newfoundland with a resultant four-fold increase in charges laid. Staffing of up to four new enforcement positions was also initiated.

Market hunting continued in Newfoundland and Labrador (Murres and Eiders), New Brunswick (Scoters) and Nova Scotia (Black Duck and Geese). These and other enforcement problems led to plans for significant increases in enforcement efforts.

Some progress was made in enforcement under the Canada Shipping Act, which controls the discharge of oil at sea. One ship, said to have caused the loss of several hundred seabirds, was charged and required to post a $300 000 bond before leaving port.

Habitat Protection and Management

Several areas of the Atlantic region received special attention because of importance as wildlife habitat. Malpeque Bay, PEI was declared a wetland of international importance under the RAMSAR convention. The Southern Bight Minas Basin, NS, proclaimed a Ramsar site in 1987, was declared as Canada's second site in the Western Hemispheric Shorebird Reserve Network during a special event in August. Purchase of parcels of land continued at Portobello Creek, New Brunswick, for the province's fifth National Wildlife Area (NWA). Three First-step Projects under EHJV have begun at Grand Lake Meadows, NB, Yarmouth salt marshes in NS and Grove Pine-Big Brook Wetlands in eastern PEI. A regional five-year prospectus has also been completed. New sanctuaries are being established at Green and Shepherd Islands in Newfoundland for Eider Ducks and at PEI National Park for Piping Plover.

The management of NWAs continues. New management plans are under way for Boot Island in Nova Scotia and Portage Island in New Brunswick.

Other activities include

- CWS participation in the Eastern Habitat Joint Ventures (EHJV) Coordinating Committee in the region.
- CWS participation in Wildlife Habitat Canada - Environment Canada wetland economic evaluations for Nova Scotia and in the development of a region estuary project.
- The wetland inventory was revised and updated to correspond to PEI and NS watersheds.
- A pilot study for a wetland inventory has started in Newfoundland.

Environmental Assessment

Participation in the Environment Canada Working Group on the fixed link crossing to PEI continued with reviews of a general IEE followed by evaluations of specific project proposals by several groups of companies.

The project has been delayed pending the results of a FEARO panel review in 1989.

Rare and Endangered Species

The endangered species display continues to be in demand at county museums, for environment and wildlife week programs and other NGO functions. A display schedule is being developed.

CWS coordinated the release of 28 Peregrines in the upper bay of Fundy as part of the Peregrine (Anatum) recovery program with major funding by World Wildlife Fund Canada and sponsors Denison Mines Ltd. and the Tecolote Foundation. Continued collaboration by Fundy National Park, Nova Scotia Wildlife Division and the New Brunswick Ministry of Natural Resources resulted in a successful program. Three territorial pairs were reported for NB and two returning single birds were seen in NS.

An Atlantic Piping Plover recovery team was formed in November following a national team meeting in April. Actions plans were developed with support of Quebec and Atlantic provincial agencies to assist in determining efforts and costs of recovery objectives.

Labrador Harlequin Duck and Peregrine Falcon surveys continued along the northern coast with the support of World Wildlife Fund, the Newfoundland Wildlife Division and the Natural History Society. Several more records of both species were made as well as the observation of two musk oxen.

Toxic Chemicals

A complete review of the effects of fenitrothion on forest songbirds was conducted. Results are to be combined with two other reviews (pollinating insects and aquatic organisms) and published as an Environment Canada report. Expertise and laboratory services were again provided to Newfoundland in support of that province's environmental studies of the risks of the hemlock looper spray program. A long-term monitoring study of contaminants in wild ducks and terrestrial birds was initiated.

A study to determine the effects of pesticide spraying on birds in orchards was started in the Annapolis Valley of Nova Scotia.

Long-Range Transport of Airborne Pollutants

Studies on the influence of acidity on the retention and release of benthic nutrients in the Kejimkujik Calibrated Basins (NS) were completed along with the baseline characterization of the benthic invertebrates. The Kejimkujik Calibrated Basin Symposium (Keji '88) was successfully organized with more than 100 local and visiting scientists in attendance. Atlantic region LRTAP studies in the Kejimkujik area were summarized and reviewed. Canadian Wildlife Service Atlantic region presented seven papers or posters. The transactions and papers delivered will be published in scientific journals.

A waterfowl population and habitat monitoring project was initiated in Kejimkujik National Park, including a combination of aerial and ground surveys. The surveys will allow investigation of the relationship of Common Loons to the presence or absence of fish and determination of habitat preferences and requirements of other waterfowl. Kejimkujik National Park is located in a very sensitive area of Nova Scotia with moderate acid deposition.

QUÉBEC REGION

Regional Specialty:

St. Lawrence Action Plan

The St. Lawrence Action Plan, which was announced on June 3 of last year, has played a major role in orienting all the activities of the Canadian Wildlife Service (CWS) in the Québec region, and this orientation has been reflected in most of what we have accomplished this year. The CWS was entrusted with certain responsibilities under the Conservation section of the plan. This section primarily makes provision for measures to protect habitats and endangered and vulnerable species. Along with the St. Lawrence Centre and the Department of Fisheries and Oceans, the Service has been very actively involved in the characterization of the St. Lawrence biocenoses with a view to implementing an adequate follow-up system for the biotic communities. It is also taking part in publishing the St. Lawrence Biocensis Atlas and preparing the report on the environmental status of the river.

Management Of Migratory Bird Populations

Seabirds

Ever since 1925, the CWS has been regularly involved in bird census in the North Shore sanctuaries to determine variations in the numbers of nesting couples and analyse the causes. The most recent census, carried out in the summer of 1988, revealed a marked increase in all the families of seabirds found in the sanctuaries. The Alcidae, representing 58% of the nesting birds, continue to grow in numbers, a phenomenon that has been observed since 1977.

Common murre and razorbill populations have increased by 10% and 12%, respectively, since 1982. One of the main reasons for this reassuring comeback of the Alcidae family, whose numbers had dwindled alarmingly in the '70s, is thought to beter enforcement of the regulation of sanctuaries combined with a greater effort to educate the local population. The Alcidae may have also been helped by the selective fishing practices of local fisheries, but the situation could be reversed once more. The current abundance of caplin seems to favour exploitation of this resource by local fishermen, and this could lead to a new decline in Alcidae populations.

A project in the St. Lawrence estuary and gulf has made it possible to compare the degree of contamination of razorbills in these two areas. Once analysis of the eggs and prey has been completed, the effect of contaminants on productivity can be quantified. Preliminary results, however, indicate a substantial difference between the two groups studied. Despite similar hatching rates, i.e., 81 % in the estuary compared to 83% on the North Shore, the fledging rate was definitely lower in the estuary and the volume of eggs, smaller. In addition to this project some 300 razorbills were marked, increasing the cohort of birds of this species to be marked in the past three years and thereby helping to improve our understanding of the dynamics of this population on the North Shore.

Land Birds

The project involving the preparation of the Québec Breeding Bird Atlas continued with the completion of the fifth and last census-taking campaign in the field. Five bird clubs or societies sponsored teams working in the field, while over 950 volunteers took part in collecting basic data. In addition, the 5 000 volunteers who expressed an interest in the project are being actively solicited for any unpublished data they may have. Mention should be made here of the enthusiastic support the media, notably the daily, *La Presse*, and Radio-Canada, have given to this project. The fourth issue of the Info-Atlas newsletter is in press. Various coloured maps showing the range of distribution of the bird species are being prepared and will soon be submitted to the Atlas volunteers for their opinions and comments to help orient the Québec Atlas editorial staff in the monumental task that faces them over the next two years.

Game Birds

Black Duck

The fourth census of black ducks nesting in Québec's boreal forest revealed a significant increase in numbers in the study area, the duck count soaring from 16 000 to close to 20 000. The 1988 season will have been marked by the greatest upsurge in population observed since the beginning of the countin 1985. As a result of a preliminary study of habitat use by the broods, it was possible to distinguish 16 types of habitats favoured by the species in a boreal forest.

The census-taking and long-term follow-up program, which was set up and tested by Québec region biologists, was adopted by the Black Duck Joint Venture Technical Committee as a basic tool to implement a vast census-taking operation covering the species' total nesting area beginning in 1990. Furthermore, nighttime-banding experiments conducted over the summer suggest interesting possibilities for marking local black ducks living in the hinterland to obtain a more accurate understanding of the dynamics and migratory patterns of subpopulations of this species.

Eider Duck

The North Shore migratory bird sanctuary survey revealed a remarkable increase in the numbers of this population, which many consider vulnerable. Marked increase of Eider duck populations have resulted from stringent protection and monitoring measures applied throughout the Mingan Archipelago National Park Reserve (Betchouane and Watschishu Migratory Bird Sanctuary), and similar efforts by the CWS at the Sainte-Marie Islands Migratory Bird Sanctuary. With help from the Canadian Parks Service the CWS conducted censuses of wintering eider duck populations. The main purpose of these censuses is primarily to develop an effective technique for counting flocks of these ducks by means of aerial photography.

Snow Goose

The snow goose population continues to rise. According to the mathematical model developed some time ago for this subspecies, the flock consists of an estimated 363 750 individuals. Since the fall, this number needs some revision to take into account the year's young, which represent one-third of the total fall population.

With the increase in the numbers of this species, expansion of its usual stopover areas during migration and its tendency to make greater use of fields in spring, there has been growing concern among biologists as well as farmers. With the assistance of various departments and interested organizations, the CWS has begun to take a close look at possible pertinent management plans. Some of the proposed solutions could be implemented before next fall.

Application of Regulations

The North Shore sanctuary protection plan was maintained this year with the emphasis still on banning spring hunting and egg gathering. The remarkable increase in the number of all seabird species, which was confirmed by the 1988 census, is an indication of the appropriateness of this line of action. The importance of an integrated and energetic approach has been demonstrated by the promising results obtained at the Mingan Archipelago National Park Reserve for the eider population.

In the fall, the CWS redoubled its efforts in the application of the Act, receiving assistance from the Royal Canadian Mounted Police and the Ministère du Loisir, de la Chasse et de la Pêche and was able to approach 500 hunters. Ultimately 50 charges were laid under the Act. With the prolonged presence of its officers in the area, the CWS was able to conduct a thorough check of the conditions under which captive birds were bred by aviculture permit-holders. Judging from the fact that only three warnings were issued and only one seizure of birds was made during the operation, it was estimated that most of the bird breeders were complying with breeding standards.

Hunters and conservation officers are currently engaged in discussions to pinpoint the various problems raised by migratory bird hunting and formulate solutions that reconcile hunters' needs with the principles of conservation.

James Bay II

Several joint projects successfully negotiated with Hydro-Québec have been designed primarily with a view to updating existing data on migratory birds in the Grande rivière de la Baleine and Lac Bienville sectors. Further research or surveys may be necessary to add to the current bank of basic data. A report in the final stages of completion will indicate further census and data-collection needs.

Wildlife Habitat Management

Canadian Wildlife Service and Canadian Parks Service Pilot Project

The findings from the first year of this two-year project have just been completed and analysed. They have proved so successful and satisfactory, the second phase has already been planned. While the project sets out to increase public awareness of the Department and the role it plays in the area of conservation, the primary aim is to make the public conscious of the complementary action of the Canadian Wildlife Service and the Canadian Parks Service in the conservation and development of

protected sites. Up to now, the focus has been on communications, marketing and advertising. To give a concrete edge to this operation, it was decided to pair off two sites that are protected by Environment Canada, i.e., the Cap Tourmente National Wildlife Area and La Mauricie National Park. To ensure the success of the operation, promotional posters were distributed, and regional competitions and information campaigns were organized. In addition, an attempt was made to facilitate the exchange of information between staff members of both organizations. Not only was the visibility of the two services enhanced, but the initial objective, which was to make the public aware of the Department's role in conservation matters, was achieved.

St. Lawrence Action Plan – Habitat-Protection Program

Since the St. Lawrence Action Plan did not really begin until September of the first year, the objectives had to be defined accordingly. The habitat-protection program got off to a rapid start. The three projects to consolidate the National Wildlife Areas (NWA) through the acquisition of missing tracks of land were successful within the deadlines set for the Cap Tourmente, Baie de l'Isle-Verte and Lac Saint-François areas.

A public-awareness and information project is being set up to emphasize the need to protect the wetlands and underline the importance of the NWA network in Québec. The design phase has already been completed, and beginning this summer, the project will be implemented in the most heavily visited areas.

A significant portion of this part of the St. Lawrence Action Plan will be devoted to the new mechanisms set in place to support private groups. The first year of the plan enabled us to create new co-operative mechanisms to meet both our needs and the expectations of the groups. The latter were able to make their points of view known during a workshop organized by the CWS last December. Thirty organizations took part in the workshop and all of them stressed that it was both important and necessary for the CWS to exercise strong leadership in the field of habitat protection.

In addition, several wildlife development projects involving, for instance, the planting of particular kinds of vegetation or the restoration of degraded habitats have been designed for implementation on a trial basis as soon as the weather permits.

North American Waterfowl Management Plan – Joint Eastern Habitats Plan

The North American Waterfowl Management Plan got off the ground in Québec this year with the Baie-du-Febvre project at Lac Saint-Pierre. This was the first phase of the Joint Eastern Habitats Plan.

For subsequent phases, a five-year plan has been drawn up with the assistance of the Ministère du Loisir, de la Chasse et de la Pêche the Fondation de la faune du Québec and Ducks Unlimited. The *Atlas of Priority Areas for Protection* published by the CWS in 1988, as well as the list of priorities, which was established following integraton of data from the Service's regional bank, provided an essential basis for a solidly documented five-year plan giving priority to sites of national value for waterfowl.

The Joint Eastern Habitats Pan has got off to a very good start, especially since the arrival of the plan co-ordinator for eastern Canada. There are many projects and the plan is ambitious. The CWS intends to play a major role in the plan in Québec.

Partnership

The idea of a partnership has been tested on a more or less official basis for several years in some of the national wildlife areas. It was realized that non-profit groups could add to the quality and diversity of our programs in the domain of development and arousal of public awareness as well as of

supervision. It was necessary to improve our approach, make various administrative constraints more flexible and adapt to this new way of operating. The impressive expertise available to the CWS was used to good advantage with the result that we will be able to conclude co-operative agreements with several organizations for next year. Thus, in Cap Tourmente, la Société linnéenne du Québec is prepared to carry out the interpretation program under such an agreement rather than on a contractual basis. These agreements based on the mutual consent of the parties involved are negotiated for several years.

Emergency Oil Spill Plan

Following the major oil spill opposite Québec City last May, it was decided to set up a veritable network of centres for cleaning oil-coated birds in sensitive areas along the St. Lawrence River. Five of these centres are already operational thanks to the assistance of the Canadian Parks Service and the Ministère du Loisir, de la Chasse et de la Pêche and especially to financial aid from the Ultramar Company.

Lands Branch Contribution

When Lands Branch staff members became part of the CWS, some team projects were given a new orientation in line with the objectives for managing the habitats or establishing the environmental status of the St. Lawrence, in close co-operation with the St. Lawrence Centre.

A regional action plan on the state of the environment was drawn up, and a strategic plan to integrate data into this plan was completed. There are several feasibility studies under way and a draft agreement is currently being negotiated with the Canada Centre for Remote Sensing. An initial environmental data base with spatial references and a multidisciplinary analysis of the river will help to further understanding of the river environment.

As part of the habitat management plan, a survey has been made of the wetlands along the St. Lawrence River, particularly in the Lac Saint-Louis, Lac Saint-Pierre and Kamouraska areas. It will shortly be completed and all of the data will be published as a report at a later date.

Conservation of Endangered Species

Peregrine Falcon

Working in close co-operation with the staff of Forillon National Park within the framework of the pilot project mentioned earlier, the CWS released three young falcons from the top of the Mount St. Alban cliffs, the highest point in the park. The release was given vast publicity as the media had been notified of the transfer of the young falcons from Québec City to Gaspé.

The campaign to reintroduce peregrine falcons into the province, conducted jointly by the Minis-tère du Loisir, de la Chasse et de la Pêche and the CWS, was a resounding success. Ten territorial couples, including 5 nesting couples, were counted in the summer of 1988 and at least 11 young birds survived to the fledgling stage.

Piping Plover

According to the data at our disposal, the Piping Plover does not survive anywhere in Québec except on the Magdalen Islands. The second phase of the population survey of this endangered species,

carried out in the Gaspé peninsula and on the North Shore, failed to reveal the presence of any Piping Plovers although there had been one known case of nesting on the coast in 1987. Because of the critical situation, funds were provided by the St. Lawrence Action Plan to launch a substantial public awareness campaign among the island residents. The aim of the campaign is to alter some of the behaviour of the inhabitants and tourists who use the beaches and dunes favoured by the plovers and especially to develop a considerate attitude towards the species, which depends on the islands for its survival in Québec.

St. Lawrence Beluga

Three major initiatives have left their imprint on the beluga file. The first of these was the launching of the St. Lawrence Action Plan which gave concrete form to the Department's commitment to deal with the pollution problem and to create the Saguenay marine park. The contribution of the Department of Fisheries and Oceans, which was entrusted with the St. Lawrence Action Plan's budget and asked to assume the responsibility for the belugas and several endangered fish species, was emphasized on that occasion. At the end of June, the beluga survival plan, a joint Environment Canada and Fisheries and Oceans venture, was published and launched. This plan, moreover, was to give impetus to discussions at the Forum international pour la survie du Béluga du Saint-Laurent (international forum for survival of the beluga in the St. Lawrence).

The Forum was held in Tadoussac at the end of September. Over 280 participants met for three days to study the situation concerning the beluga and try to determine protective measures that might contribute to its survival. The press coverage was excellent and extended beyond our borders. Forty representatives from print and electronic media covered the three-day event. This was the first time a forum of this type had brought together representatives of the provincial and federal governments, scientific community, industry, pressure or conservation groups and sociocultural milieus as well as local tourist interest groups. The Forum's main recommendations will shortly be published in the first issue of the beluga newsletter which the Department of Fisheries and Oceans has promised to produce to maintain a link between the many diverse parties involved.

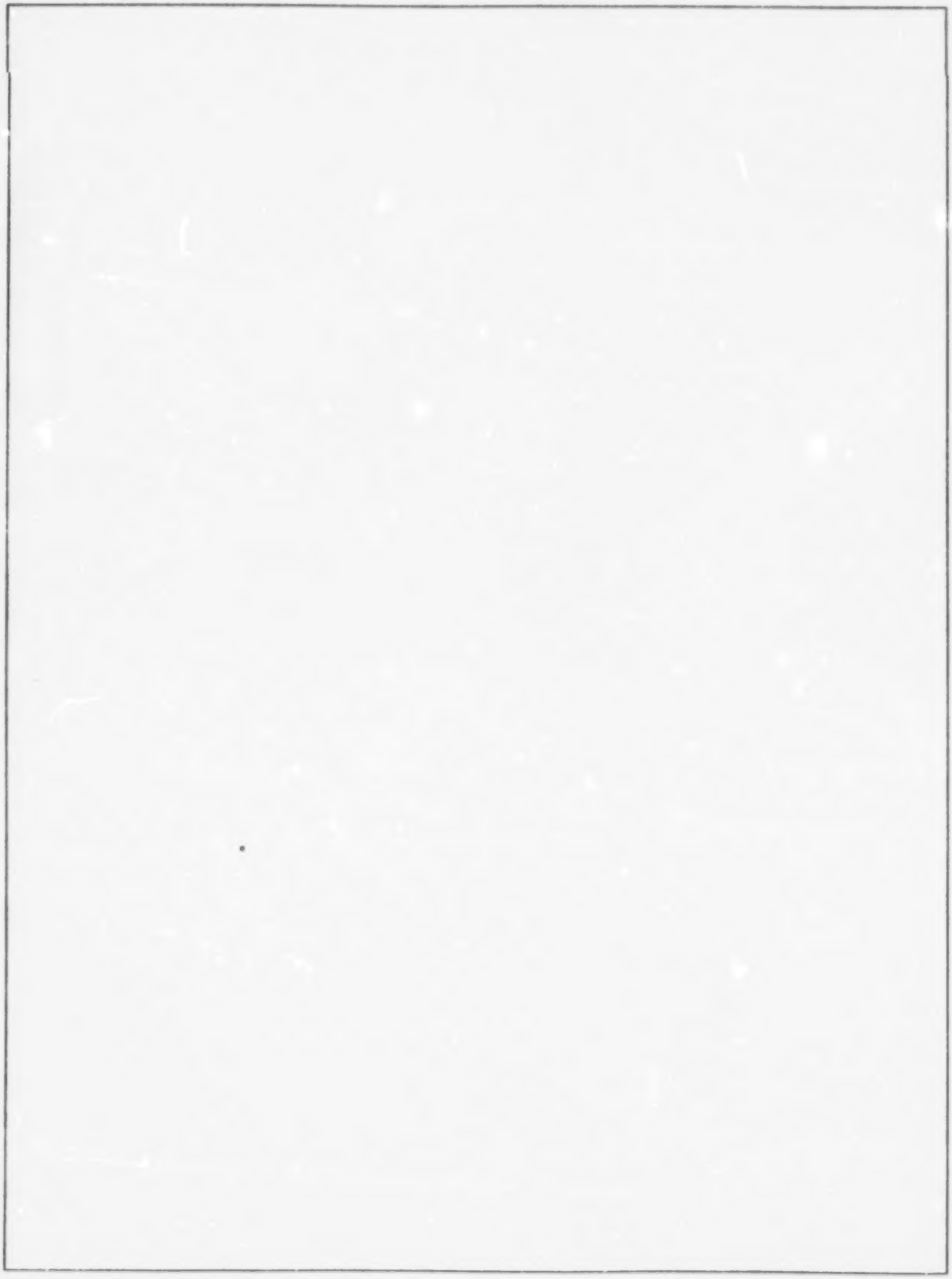
Toxic Chemicals

The study of rêsidual concentrations of contaminants (especially dioxins and furans) in wildlife exposed to pollutants following the fire at the PCB warehouse in Saint-Basile-le-Grand should shed new light on the extent of contamination in this region. The interpretation of results obtained by the other partners in this venture, i.e., the Québec Departments of the Environnement, Agriculture, Pêcheries et Alimentation and the Canadian Department of Health and Welfare, will be supplemented by an analysis of the data on contamination of the food chain. This will also provide an opportunity to study the mechanisms involved in the intoxication of small wildlife and assess its potential as a bioindicator of environmental contamination.

Another ecological accident, namely, the oil spill at Saint-Romuald last May, enabled us to broaden the field of application of the environmental follow-up project, using Pekins. This project, implemented in 1987, consists of placing the ducks for an adequate period of time in environments that have been heavily contaminated by industrial or other waste and subsequently of analysing the tissues. Since these ducks are characterized by their sedentary behaviour, they accurately reflect the degree of pollution in a given area. Following the above-mentioned oil spill and resulting high levels of contamination of the Montmagny Archipelago shoreland marshes, determinations of the levels of exposure

of the ducks introduced in this area will enable us to assess whether these zones, which are extensively used by geese during their migratory flights, are safe.

In addition, the Service is following up a doctoral thesis project on maple dieback and its effect on the composition of bird communities. Another project dealing with the effect of diazinon and acephate treatment of ornamental trees on the American Robin will shortly be published as a CWS (Québec Region) technical report.



ONTARIO REGION

Migratory Bird Population Surveys and Management

Waterfowl, Southwestern Ontario

Aerial surveys of the Long Point marsh complex were completed in early June. A paper was prepared, "Changes in Waterfowl Use of the Long Point Marshes from 1974 to 1988".

The surveys section conducted the Ontario portion of an Atlantic flyway program to document the number of breeding Giant Canada Geese. A total of 270 randomly distributed plots were surveyed and a final estimate suggested 15 400 breeding pairs of geese for southern Ontario. This number of pairs would result in a fall flight that approaches 100 000 birds.

Southern Ontario duck-banding operations resulted in a total of 1 861 ducks, an exceptional total considering the record drought. As part of the program, USFWS reward bands ($100) were placed on every fourth immature male mallard; this assisted a US study of band reporting rates.

In addition, the surveys section participated in an experimental duck banding program along the Hudson Bay coast with Ontario Ministry of Natural Resources (OMNR) staff from Moosonee and U.S. Fish and Wildlife Service staff. This drive-trapping operation was quite successful (more than 500 birds in three days), although most of the birds banded were moulting adult males, the sexage group least likely to provide useful population information.

Black Duck and Mallard mate selection research projects continued at the St. Clair Wildlife Area, and were conducted by Dr. Brodsky in association with the University of Western Ontario. Results for the period show that, for birds reared in isolation, female Black Ducks prefer male Black Ducks while female Mallards show no preference to either species. Previous studies show that females of both species prefer dominant males and, when mixed, these are predominantly Mallards.

A project was initiated to determine the portion of incapacitated ducks (i.e. ducks not capable of flight or dead) as a result of lead poisoning at the Long Point waterfowl management unit. While final results have not been established, the portion of birds lead-poisoned at Long Point was low. Some birds were also picked up at Lake St. Clair. There the portion of lead-poisoned birds was relatively high.

Waterfowl, Northern Ontario

The special survey area established in 1987 in northeastern Ontario was resurveyed in order to monitor the population trend of the Black Duck, a species that has shown a general long-term decline on the wintering grounds. While both Black Duck and Mallard counts were slightly lower numerically than those of the 1987 survey, these differences were not statistically significant. All other species of

waterfowl plus Common Loons were also recorded during the survey which we plan to repeat in future years.

Initial coverage was completed for the assessment of the distribution of breeding waterfowl throughout northern Ontario; this survey was started in 1980. The last three survey blocks, located in the western Hudson Bay lowlands, were covered by helicopter in early June. Waterfowl counts were generally low inland, increasing toward the coast. The block around Fort Severn and extending over the tundra-taiga interface contained the highest density of breeding waterfowl recorded during the northern Ontario survey (676 pairs/100 km2). Logistic assistance for this work was provided by the Ontario Ministry of Natural Resources.

The first year of a three-year study of waterfowl distribution and productivity in the Ontario portion of the Great Clay Belt was completed. This work aims to determine waterfowl breeding density, distribution and level of productivity, and to relate these parameters to habitat types. Field work comprised three helicopter surveys of study plots throughout the belt; these included an initial breeding pair survey in spring followed by two brood surveys during the summer. Habitat characteristics, particularly of the shoreline, are determined through interpretation of air photos and videotapes of the plots and will be related to LANDSAT imagery of the whole study area. A wildlife habitat cover map will be produced from this analysis. This work involves the collaborative efforts of Ducks Unlimited, OMNR, Wildlife Habitat Canada and the CWS.

Waterfowl, Eastern Ontario

Studies continued into the staging of diving ducks, primarily Greater and Lesser Scaup, along the Prince Edward County shore of Lake Ontario. Further analysis was undertaken of a large sample of these ducks killed in fishermen's nets. As well, ground observations were made of feeding sites and activity patterns of the birds. A survey of benthic substrate along the near-shore of western Prince Edward County was also completed. This year differed considerably from last in that continuous high winds kept the birds off Lake Ontario and moved them to smaller lakes inland; the kill by accidental netting was negligible.

Throughout the province, survey staff participated in the Continental Canvasback Survey, the mid-December Canada Goose survey and the midwinter waterfowl survey, the latter two in cooperation with the Ontario Ministry of Natural Resources.

Shorebirds

The *Atlas of Neartic shorebirds* on the Coast of South America was published early in 1989. The atlas consists of two volumes. The first contains an overview of the wintering distribution of various shorebirds on the coast of South America, with discussions of the environmental factors affecting the birds' distributions and conservation aspects of the work, including the Western Hemisphere Shorebird Reserve Network initiative that arose from the research. The second volume contains country-by-country accounts of the work, with extensive information on the habitats and geomorphology of the coastlines as well as on the birds themselves. The atlas will serve as a major resource document for a wide range of government and non-government agencies concerned with the conservation of coastal habitats and shorebird populations in South America; excerpts are already being used on conservation training courses for biologists and administrators in South America organized by the Western Hemisphere Shorebird Reserve Network.

Aerial surveys of the coast of Panama in February 1988 resulted in the identification of wintering areas of major international importance for Western Sandpipers (*Calidris mauri*) on the Gulf of Panama. It is thought that many of these birds pass through the equally important lower Fraser river delta in British Columbia during migration.

Work on the physiology and migration of High Arctic migrants continued at Alert, Ellesmere Island, during the period of spring arrival in May-June 1988, in collaboration with the U.K. Nature Conservancy Council. Understanding the energetic requirements and performances of the birds has important implications in emphasizing the importance of stopover areas for the survival of the populations concerned and thus for their future conservation.

Fieldwork continued on Rowley Island in the Foxe Basin to investigate breeding shorebird and other avian populations and to develop remote-sensing methodology for assessing the distribution of breeding habitats of the birds in collaboration with the Canada Centre for Remote Sensing.

Aerial surveys were flown of the James Bay coastline between Moosonee and Winisk in early August 1988 in collaboration with the Ontario Ministry of Natural Resources, to update information on shorebird distribution on this major migration corridor. Plans were developed with OMNR to participate in a study of coastal habitats using remote-sensing technology.

A highly successful meeting of the CWS Shorebird Committee was held in Delta, B.C., in April 1988. The committee coordinates shorebird work on a national scale and is working to identify potential Western Hemisphere Shorebird Reserve Network sites across Canada.

Colonial Waterbirds of the Great Lakes

Caspian Terns in Lake Ontario were counted, and a total of 450 Caspian Tern chicks were colour-banded in the Great Lakes in cooperation with the United States.

Common Terns in Lake Ontario were monitored, and an artificial tern-nesting raft was evaluated at Tommy Thompson Park, Toronto.

Black-crowned Night-Herons were studied, by a CWS contractor, at Tommy Thompson Park. Breeding ecology and impact on other colonial waterbirds was investigated.

A visit was made to Gull and High Bluff islands (Presqu'île Provincial Park) during the breeding season, and written advice was given to the park naturalist regarding the long-term management of the seven species of colonial waterbirds nesting at the two islands.

Meetings were held with the USFWS to plan for an inventory of all colonial waterbirds nesting on all Great Lakes during the 1989-91 breeding seasons.

A paper on the status of colonial waterbirds in Hamilton Harbour appeared in print, two reports on seasonal distribution of Caspian Terns and Black-crowned Night-Herons were submitted to a scientific journal and a draft chapter on "Status and conservation of seabirds of the Great Lakes" was submitted for publication by the ICBP.

Boreal Birds

A forest bird monitoring program, using volunteers, was successfully launched. The goal of the program is to establish a long-term, habitat-specific breeding bird survey that will provide trend data for birds breeding in all the major forest habitat types in the province. In 1988, some 100 expert amateur ornithologists participated in the program. Ultimately, the monitoring program will use the contributions of several hundred volunteers and be organized with local conservation organizations.

A study was initiated to gather information on a selection of protected sites, representing all forest types, in southern Ontario. These data will form a baseline for monitoring changes over time in bird communities.

Gull and Goose Control

CWS advised landowners affected by Ring-billed Gulls nesting on their properties and monitored the effectiveness of operations to control several colonies. A paper, "Ring-billed Gull colonies at urban/industrial sites in the Canadian Great Lakes", was prepared for the symposium of the 32nd annual conference of IAGLR entitled "Gulls, terns and waterfowl in management: problems and solutions".

An inventory was made by CWS contractors of the rapidly expanding Ring-billed Gull population in the Ottawa-Hull area. This population is beginning to create problems, including a flight-safety threat to the Snow Birds aerial acrobatic team that performs above the Ottawa river during Canada Day celebrations.

CWS coordinated Canada Goose control on the Toronto waterfront and near the Upper Canada Migratory Bird Sanctuary in conjunction with OMNR staff.

A total of 1115 adult geese were removed from the Toronto waterfront and donated to the state of Oklahoma. The area treated along the waterfront was slightly expanded from previous years, to acquire sufficient geese to make the enterprise worthwhile. Ministry districts of Thunder Bay, Sudbury and Sioux Lookout received a total of 250 goslings from the waterfront.

Approximately 600 Canada Goose eggs from the vicinity of the Upper Canada Migratory Bird Sanctuary were picked up by Oklahoma.

The number of Canada Geese along the Toronto waterfront in the vicinity of the island airport during May, June and July continues to decline despite an overall expansion of the population in southern Ontario.

Habitat Protection and Management

Two major RAMSAR designation proposals, Presqu'ile Marshes (eastern Lake Ontario) and Rondeau Provincial Park (Lake Erie), are completed and are awaiting provincial approval.

In cooperation with OMNR and a local nature conservation group, Osprey platforms were erected at Long Point National Wildlife Area. The Bald Eagle hacking project terminated during the previous year is starting to show results, with two active nests at Long Point (four eaglets raised). A total of 10 nests on the north shore of Lake Erie west of Long Point were documented during the 1988 nesting season.

In the Ottawa area and in cooperation with OMNR, a group of 15 young peregrine falcons were hacked at three sites. One wild female peregrine has taken year-round residence in Ottawa, and at least two active sites have been located in the area. The release program in southern Ontario is being evaluated and no releases are planned for Ottawa in 1989. Public and media interest was very high.

Monitoring vegetation response to water-level manipulation continued at St. Clair and Big Creek National Wildlife Areas in Ducks Unlimited impoundments. Banding stations were active in the two NWAs.

The Long Point Waterfowl and Wetlands Research Fund was established as a "partnership arrangement" under the auspices of Nature Conservancy of Canada, with an initial endowment of $255 000. The fund is to be used to support research in the waterfowl and wetland ecology of the Long Point region of Lake Erie.

On Long Point, CWS continues to collaborate with the University of Guelph Veterinary College in a study of the ecology of Lyme disease, a tick-borne disease of deer, small mammals and possibly waterfowl, but infectious to man.

Regulations and Enforcement

The additional enforcement workshops were conducted for the training of RCMP on the enforcement of MBC Act and regulations. Some workshops were also attended by Ontario Ministry of Natural Resources conservation officers.

The RCMP has increased its activity with taxidermists, but inspections of aviculturists only take place when specific requests are made by CWS. New working relationships are being developed with the federal enforcement force, and full work planning is expected for the 1990-91 fiscal year, when CWS has its full strength of enforcement coordinators across Ontario.

Complaints about bird nuisance continue to increase with the following main activities:

- In southwestern Ontario, 102 damage permits were issued to protect crops and industrial sites from resident Canada Geese and Ring-billed Gulls. Some 10 permits were issued to golf courses.
- East and south of Ottawa, 41 spring damage permits were issued to keep some 200 000 Canada Geese from damaging alfalfa, clover, barley, winter wheat and other vulnerable crops in the fertile South Nation river area.

Six damage permits are also issued for Wolfe Island (where Lake Ontario meets the St. Lawrence river).

OMNR, RCMP and CWS staff continued a special effort to contact the most-affected farmers and increased patrols to ensure a smooth stay and passage of the geese through the corridor. The spring of 1988 was very unusual, with Canada Geese overpassing their normal spring staging areas in New York State and Wolfe Island.

Avicultural	928 (11 430 birds kept, 50 species)
Taxidermy	278
Scientific	68
Damage	159
Salvage	152
Baiting	50
Total	1635

Number of Permits Issued

Habitat Assessment and Mitigation

CWS continued its commitment to EARP through involvement with the Regional Screening and Coordination Committee, remedial action plans under the Great Lakes Water Quality Agreement, and the Great Lakes International Joint Commission.

An "umbrella concept" for coordinating government wetland work in Ontario is in the process of being implemented. An interagency work group (OMNR-IWD-CWS) will facilitate communication and information sharing among different agencies, so that wherever possible projects can provide mutual support and avoid duplication.

Eastern Habitat Joint Venture

CWS provided a representative to the Eastern Habitat Joint Venture (EHJV) technical committee to assist with the production of a 15-year joint-venture habitat plan for Ontario. This plan will outline areas, preservation, maintenance mechanisms and annual costs.

Early in the year, CWS participated in the preparation of the first EHJV project, the Matchedash wildlife management area, a 2157-hectare wetland on Georgian Bay. This wetland was chosen because it is at risk from permanent habitat loss. It has high potential as a waterfowl production area and is a critical staging area. Participating agencies include Ontario Ministry of Natural Resources, Canadian Wildlife Service, Ducks Unlimited and Wildlife Habitat Canada. Actual land acquisition will be by the Nature Conservancy of Canada as agent for the provincial crown, and the operation of the area will be the responsibility of the OMNR.

Toxics and Pesticides

The Burlington unit, in cooperation with the National Wildlife Research Centre and the Wildlife Branch of OMNR, was very active with the following major activities and projects:

- Measuring levels of exposure of avifauna (Eastern Bluebirds, Tree Swallows and American Kestrels) and their habitats to pesticides and other toxic chemicals.
- Identifying and documenting the use of agricultural croplands by avifauna in southern Ontario, in the Great Lakes basin. Corn fields, soyabean fields and apple orchards were used in this study;
- Wetlands at risk in the lower Great Lakes basin. This two-phase project will identify and assess wetlands at risk from pesticide run-off, toxic chemical and other stresses, and make recommendations for the protection and rehabilitation of wetlands in the lower Great Lakes;
- Reporting to the water quality board of IJC and the Great Lakes Working Group on trends and levels of major toxic chemical residues found in Herring Gull eggs from 14 monitored colonies throughout the Great Lakes. The database from this project, 1974-1988, is being published in scientific form and as a popular fact sheet under the State of the Environment reporting series; and
- Congenital anomalies in embryonic and post-hatch Double-crested Cormorants. Two cormorant colonies, one on Lake Ontario and one on Lake Winnipegosis, were monitored for embryonic deformities/infertility. Also examined were more than 27 000 young, hatched cormorants for the presence of bill deformities at Canadian colonies.

Long Range Transport of Airborne Pollutants (LRTAP)

The LRTAP program involved the completion of one study and the continuation of three others. The wetlands study conducted in the Sudbury area was completed. Results of the Tree swallow breeding biology study, conducted in 1986, were published in the *Canadian Journal of Zoology*. A manuscript, "Tree swallow diet in relation to wetland acidity", which summarizes the results of the feeding ecology study conducted in 1987, was submitted for publication in a scientific journal early in 1989.

In 1988, the biomonitoring program for waterfowl and their foods was implemented in Algoma. Information on waterfowl productivity and water chemistry was collected on 236 lakes, contained within nine 5 x 5 km plots on sensitive terrain. While breeding densities of waterfowl species (except fish-eating species, such as Common Mergansers and Common Loons) was higher on average in lakes with low pH (5.0 - 5.5), than in lakes with higher pH (5.5 - 6.3), the actual production of young (measured as the number of young surviving to Class 2 age per indicated breeding pair [Cl2yg/ip]) increased in relation to lake pH from a low of 1.1 below pH 5.5 to 1.9 above pH 5.5. The most significant pH effect was found among insectivores (Common Goldeneyes and Hooded Mergansers), which produced over 3 C12 yg/ip above pH 6.3, compared to an average of only 1.1 Cl2yg/ip for pH below 6.3. These data will provide the necessary baseline for monitoring waterfowl productivity in relation to changing acid deposition in Algoma in the 1990s and beyond. In 1989, the biomonitoring program will be undertaken in the Muskoka-Haliburton area.

The second year of a three-year study to measure impacts of acid precipitation on Common Loon reproduction in Ontario was completed. The study is comprised of two parts: CWS surveys of sensitive lakes (69 in 1987 and 58 in 1988) to examine loon breeding success in relation to lake acidity, area, nutrient status and fish presence; and the Ontario lakes loon survey (OLLS), a volunteer-based survey, operated by Long Point Bird Observatory to monitor loon breeding success as an indicator of the long-term effects of lake acidification. Preliminary results from both components showed a tendency for both the proportion of lakes supporting successful breeding attempts (where one or more young fledge) and the number of young fledged per hatched chick to increase as the buffering capacity of lakes increases. The OLLS will continue in 1989, and the future of the program will be assessed at that time.

A preliminary model of the effects of acid precipitation on waterfowl productivity in eastern Canada was developed by ESSA Systems Ltd., using more than 1000 wetland years of data from CWS (Ontario) LRTAP studies, including waterfowl production estimates, water chemistry, fish status and lake morphometry. Efforts to validate the model and apply it to various deposition scenarios considered in the 1990 LRTAP assessment report will continue in 1989.

Further research examined the mechanisms whereby waterfowl are influenced by changes in the aquatic food chain arising from lake acidification. A two-year study of distribution and abundance of invertebrates in relation to acidity and fish status was initiated. Preliminary results illustrate the importance of fish predation and lake acidity to the composition and relative abundance of certain nektonic and benthic taxa. A study to examine how ecological factors (mainly lake acidity and fish status) influence the reproductive success, brood movements and brood mortality of cavity-nesting ducks was initiated. In 1989, work on brood mobility and survival will be expanded to include a study of the effect of habitat quality on the investment by nesting and brood rearing female Common Goldeneyes in their clutch and brood to be undertaken by Pat Weatherhead of Carleton University.

WESTERN AND NORTHERN REGION

Migratory Bird Studies

Data Collection

Computing support for Saskatoon staff was extended in 1988-89, with installation of hardware and software required for the SAS statistical system, WPS/DOS (our link with the departmental office technology system [DOTS]) and the SPANS geographic information system. Entry of spatial databases to SPANS was initiated with the digitization of Migratory Bird Breeding in Staging Sites in all three prairie provinces, and integration with detailed observational records for those sites. Boundary and cover mapping of migratory bird sanctuaries and national wildlife areas was also started. The thrust of the SPANS work will be spatial modelling of the interactions among land use climatic changes and wildlife population distribution and abundance, particularly in the commercial forestry zone and agricultural areas of the prairies.

Shorebirds

In 1988, aerial and ground surveys of migratory shorebirds were conducted in the prairie provinces. Their results combined with the 1987 survey results and historical data have identified 17 sites that meet reserve status under the criteria of the Western Hemisphere Shorebird Reserve Network (WHSRN). Discussion with Provincial agencies are under way to have some or all of these sites designated under the WHSRN. A banding program was conducted on Little Quill Lake, Saskatchewan, with 1500 birds banded. Four of these birds have been sighted in the southeast USA and South America.

The first Prairie shorebird workshop was held 28 January 1988 in conjunction with the Prairie conservation and endangered species workshop. More than 3000 delegates participated in these workshops.

Toxics

The toxicity and environmental fate of carbofuran sprayed on pasture was studied for a second season, and a project was initiated, through the University of Manitoba, to investigate the toxicity of carbofuran-sprayed vegetation on Mallard ducklings. A feasibility study of bluebird trails as a means of monitoring the effects of pesticides on songbirds was completed under contract. Two additional

studies completed under contract were a survey of insecticide contamination of wetlands in Saskatchewan and a survey of cultural practices and insecticide use in forage crops used by wildlife.

Dabbling Ducks

Studies of homing, nest-site selection, fall-residency and population regulation in upland nesting dabbling ducks continued at the St. Denis National Wildlife Area, Saskatchewan in 1988. The study is yielding valuable information that should help us to understand the impacts of drought on duck populations and on their breeding success.

Some results have been summarized, submitted, or published in journals; other aspects are nearing completion. Complementary studies of mallard and blue-winged teal incubation behaviour, and of American crow breeding biology, are continuing in cooperation with graduate students at the University of Saskatchewan.

Range Land Management

In the aspen forest, cleared range lands associated with wetland habitat are promising as waterfowl nesting areas if they are managed to maintain some diversity of vegetation cover. In cooperation with the Prairie Farm Rehabilitation Administration (PFRA), CWS is studying the effects of brush removal and vegetation succession on the densities, distribution and success rates of nesting waterfowl on improved PFRA pastures. In 1988, preliminary surveys were initiated to document duck populations, nesting densities and brood production on two range cover types. The study will provide guidelines for managing converted range lands to ensure compatible benefits for both livestock and waterfowl.

Waterfowl Nesting Habitat

The Canadian Wildlife Service and Saskatchewan Parks, Recreation and Culture (SPRC) cooperated in the Prairie pothole project supported by Wildlife Habitat Canada, to protect and enhance and thus promote net increases in waterfowl production. Through lease agreements with prairie farmers in the municipality of Antler, SPRC protected and improved parcels of upland nesting cover and wetlands. CWS and SPRC are evaluating the prospects in terms of offsetting ongoing habitat losses and producing incremental ducks over five years ending in 1991. Through annual surveys, both agencies are documenting and comparing habitat changes and duck population responses between experimental areas and neighbouring untreated areas, to determine the contribution made by enhancing nesting habitat. Annual reports are available for 1987 and 1988.

Goose Nesting Habitat Survey

An experimental goose nesting habitat survey, in cooperation with the U.S. Fish and Wildlife Service, was carried out in the Arctic from the Mackenzie Delta to Baffin Island. With Inuvialuit help, more than 2000 Snow Geese were banded at Anderson River Migratory Bird Sanctuary, to determine the degree of mixing of Snow Geese from three western colonies and the populations that winter either in California or Mexico and New Mexico.

Lead Shot

Information on spent lead shot from hunting was gathered on heavily shot-over sites in the three Prairie provinces. Preliminary analysis indicates that a high incidence of lead in marsh substrate occurred only on the Delta Marsh in southern Manitoba

Bird Banding

Banding studies in Manitoba show high local mortality from hunting successfully breeding females whose wing moult had been delayed. Further studies of harvest patterns in Lesser Scaup on the Delta Marsh in Manitoba suggest temporal differences in the rate of harvest of the four cohorts studied.

An appraisal of wetland use by prairie ducks suggests that ephemeral and seasonal wetlands are important to breeding dabbling ducks and that there is a positive association between blue-winged teal and shoveler on seasonal wetlands.

A study area for the wetland margin study was selected, contacts made with provincial wildlife staff and an application for funding submitted to Wildlife Habitat Canada.

Spring and fall sighting summaries on Whooping Crane migration for 1988 throughout prairie Canada were distributed to cooperators and NGO's. A 24-hour Whooping Crane reporting system for sightings from the public, conservation officers and NGOs was maintained from April to December 1988. Habitat-use data were collected during the spring and fall migrations.

A fire management plan for Last Mountain Lake National Wildlife Area is complete. Several papers, one on vegetation response to single prescribed burns and a second on habitat-use characteristics of small mammals of pre- and post-burn sites are in preparation.

An evaluation of potential survey routes to assess the number and distribution of long-billed curlew in southern Saskatchewan was carried out on an 8% random sample of 1500 townships. Preliminary results are: 262 Curlew observed on approximately 25000 km2 (145 birds on 1,800 km2 within 120 townships); modest overlap in distribution with Burrowing Owl on coarse soil sites and limited overlap with other rare and endangered species such as Piping Plover and Ferruginous Hawk.

An agricultural bird census was carried out in Saskatchewan in cooperation with the National Wildlife Research Centre. Fixed-radius circular point counts and frequency-of-occurrence surveys were carried out on 33 quarter-sections in June and July; all quarter-sections were on transects previously ground-truthed by the habitat monitoring project. The potential of these census methods to investigate associations between populations of migratory birds and agricultural practices was assessed; the project also provided useful baseline data on bird populations in the province.

Habitat Conservation

Prairie Crop Damage Prevention Programs

Programs began in early August and included feeding waterfowl at established lure crops and at feeding stations on pond shorelines, and providing propane canons for scaring birds. There were 74 program areas Prairie-wide.

Crops were variable with some drought in midsummer. Fine harvest weather in late August and early September allowed most producers to harvest crops at accelerated rates, thereby allowing prevention programs to terminate before mid-September in most areas. Alberta had some delays into late September. Further, with waterfowl populations low, mallards, pintails and some geese and Sandhill Cranes inflicted less-than-average damage Prairie-wide.

The 1988 programs were planned and delivered on the understanding that a one-year extension of five-year cooperative agreements expired in March 1988 would be approved, and Environment Canada would again pay half the cost. Renegotiations of new five-year agreements for 1989 and later are to include North American waterfowl management plan areas and some additional funds; the 50/50 federal-provincial cost-sharing is to remain.

Prairie Habitat Monitoring Project

This project measures the type and size of changes in the migratory bird habitat base in the settled portions of the Prairie provinces. The study will demonstrate the extent and severity of habitat loss in different habitat zones and will aid habitat managers, policy makers and politicians in developing realistic and effective habitat conservation measures. The project has direct relevance to habitat programs under the North American waterfowl management program.

Data for the project are derived from samples of approximately 24 quarter sections each at 152 plus locations across the provinces of Alberta, Saskatchewan and Manitoba; 1985 is the baseline year and locations will be resurveyed at approximately five-year, intervals.

Contributing agencies include: the State of the Environment Reporting Branch, Environment Canada, U.S. Fish and Wildlife Service and Saskatchewan Parks, Recreation and Culture.

North American Waterfowl Management Plan

Staff served on all technical and steering committees for the North American Waterfowl Management Plan (NAWMP) in the three Prairie provinces as well as the Prairie Habitat Joint Venture (PHJV). The Habitat Conservation Section also negotiated agreements and supervised expenditures of $1.2 million for "first-phase" implementation projects.

As solutions to the waterfowl production problems on the Prairies must come incidentally to changes in agricultural land-use practices, a long-term cooperative project "The effects of livestock pasture management" is measuring the efficiency of conservation-grazing techniques in providing some nesting cover for waterfowl.

Partnerships

An agreement has been made between Saskatchewan 4-H Office, Ducks Unlimited (Canada) and the Canadian Wildlife Service to develop a junior and senior 4-H wildlife program for Saskatchewan. The major outputs of the program are:

- Junior 4-H wildlife manual
- Junior 4-H wildlife leader's guide
- Senior 4-H wildlife manual
- Senior 4-H wildlife leader's guide

The Junior program -- the manual and leaders guide -- will be ready for printing June 30, 1990.

Generally, wildlife habitat on the prairies is controlled by the private landowner. However, economic pressures have forced private landowners to use marginal land for agriculture. The consequences are evident in the amount of woodland and wetland that have been converted to agricultural use in the last 40 years.

The wildlife 4-H program will show the future farmers of Saskatchewan how sound soil and water conservation can maximize agricultural benefits. The program will also create an awareness of wildlife and their habitat requirements and through education foster a change in private land management which will benefit wildlife.

Effects Of Livestock Pasture Management On Waterfowl Nesting

Preliminary results from a North Dakota State University study of various grazing systems revealed that a twice-over rotation system, where a pasture is subdivided into four paddocks and the cattle herd is rotated twice through each paddock during the grazing season, produced more ducks and greater economic return to the landowner that did continuous season-long grazing of the pasture. Consequently, a project has been initiated on private lands in the Redvers area of southeastern Saskatchewan to assess the effectiveness of twice-over rotation grazing in prime waterfowl breeding habitat. The results will enable the North American Waterfowl Management Plan to determine the feasibility and practicality of encouraging private landowners to adopt rotation grazing as an alternative to the more common practice of continuous grazing, which has long been known to contribute to overgrazing and loss of nesting cover.

The overall objectives of the grazing project are as follows:

- To determine the differences in nest success of upland-nesting ducks on continuously-grazed and rotation-grazed native pastures;
- To determine whether the differences recorded are the result of the contrasting management regimes' effects on vegetation cover;
- To monitor changes in vegetation cover and the effect these have on nest-site selection, and protection of nests from destruction by nest predators;
- To compare economic costs and benefits associated with the two grazing systems;
- To develop range-management recommendations that result in an optimal balance of waterfowl and livestock benefits.

The project is heading into the second of its planned eight years. Late 1987 and most of 1988 were spent selecting suitable study sites within the rural municipality of Antler, negotiating with landowners and livestock operators to secure their participation, collecting pre-treatment information on the biological and livestock production aspects of the study sites and building the necessary electric cross-fencing required for the rotation-grazed pastures.

Trumpeter Swans

Twenty six adult Trumpeter Swans from the Nahanni Butte area, NWT, were collared in July, and 13 cygnets were marked with patagial markers in September. Cooperating U.S. biologists and the public have provided more than 200 observations of marked Trumpeter Swans. NWT trumpeters have been observed wintering in the Yellowstone and Grand Teton National Parks, Red Rocks Lake National Wildlife Refuge and Harriman State Park with major concentrations on the Teton River, Idaho. More than 20 observations of Red-collared Trumpeters have been received from locations around Waterton Lakes National Park and the Grande Prairie area during spring and fall migrations.

The 1988 aerial surveys indicated a 47% decline in brood production and a 57% decline in total cygnets produced compared to 1987. It is suspected that harsh weather on the wintering grounds and torrential rains during the hatch were the major factors responsible for the poor production in 1988. Fifty blood samples were collected and submitted for baseline blood data and blood parasite analysis in cooperation with the University of Minnesota College of Veterinary Medicine and Memorial University in Newfoundland.

Field plans are now being made to mark, band and blood sample more Trumpeters during the 1989 season. Nahanni National Park Reserve warden service will cooperate with the project to mark and sample swans breeding in the park.

Waterfowl Monitoring Under The Northern Flood Agreement

In 1986, Environment Canada began a five-year program of ecological monitoring in connection with a large hydroelectric project in northern Manitoba. The purposes of the program are to determine the impacts that result from the project on the five Indian bands covered by the Northern Flood Agreement and to identify remedial measures.

As part of this program, CWS has been in monitoring fall waterfowl use of two areas affected by the hydroelectric project: the Outlet Lakes area north of Lake Winnipeg and the Rat-Burntwood rivers system upstream of the Nelson river. In both areas, there were reports from the local Indian communities of fewer waterfowl for hunting in the fall.

Postproject waterfowl use, determined through aerial surveys, will be compared with information obtained from interviews with local hunters and preproject data to find out the effect of the project on the availability of waterfowl to hunters. Possible remedial measures will be recommended where project-related impacts are identified.

Population Management and Enforcement

Management Surveys

Drought on the Canadian Prairies severely impacted waterfowl during 1988. May breeding population surveys showed a continued reduction (19%) in ponds available in 1988 following a 35% reduction in 1987 compared to 1986. The 1988 estimates of numbers of Mallards and total ducks were the lowest since the survey was initiated in 1955. There was some overflight to northern areas. However, Mallard and total duck numbers in Western and Northern Region were down by 4% and 8%, respectively. Aerial surveys in July confirmed expectations that waterfowl production in Prairie Canada was very poor in 1988.

To monitor the recovery and survival rates of Mallards in the Canadian Prairies, 16 banding stations were maintained in 1988 in cooperation with the United States Fish and Wildlife Service. Although duck numbers were low an intensive effort by field personnel resulted in the banding of more than 30 000 mallards and 20 000 ducks of other species as well.

Habitat monitoring during the breeding ground survey indicated that the quality and quantity of waterfowl breeding habitat are not improving. Reduced numbers of ponds were available for breeding ducks in 1988, and 23% of the basins and 76% of the margins were impacted by some type of agricultural activity.

Legbanding and neckbanding of small Canada Geese along the west coastline of Hudson Bay and of Snow Geese in the western Arctic continued in 1988. Subsequent neckband observations of these geese in Prairie Canada and the United States was about twice the rate of that in 1987. With this increased cooperation, and with an improved observation network, changes in migration patterns are being noted. Canadian Wildlife Service staff coordinated and conducted neckband observations of Snow Geese in Mexico in 1988 and noted a substantial increase in observations.

A photo inventory of the Snow and Ross' Goose colonies in the central Arctic was completed in 1988. Initial analyses indicate that number of Queen Maud Gulf colonies have increased by 1257. Preliminary counts suggest the breeding populations of Ross' and Snow Geese have more than doubled since the last survey in 1982.

In conjunction with these dramatic increases in Snow Goose numbers, a pilot program was initiated in 1988 to examine habitat degradation by Snow Geese at the McConnell river colonies using LANDSAT imagery. Known areas of habitat destruction, observed on the ground, can be detected by this method.

Enforcement Activities

In response to record low breeding populations and poor production the duck-hunting seasons were further restricted in 1988. Reductions in the total bag limit and the limits for mallard, pintail and canvasback were implemented in Manitoba, Saskatchewan and Alberta. Hunter reaction to predicted low fall flight and restrictive regulations was a reduced effort. As of January, licence sales in Prairie Canada declined by 19% in 1988 compared to 1987. This is a continuing trend, with permit sales now being about 60% below the peak value of 1979.

Western and Northern region enforcement officers conducted several migratory bird enforcement courses for the RCMP, park wardens and provincial wildlife officers. Coordinated sessions for both the RCMP and provincial officers were held in Winnipeg and Regina. Hunting was greatly reduced in 1988 because of the reduction in licence sales and drought.

Initial rewrites of the migratory bird regulations and the migratory bird sanctuary regulations were completed in 1988. These were attempts to remove existing ambiguities and bring these regulations up to date. Enforcement staff have initiated a process to conduct a wildlife undercover management training course. Meetings have been held with most wildlife jurisdictions, and assistance has been sought from the Ontario Provincial Police, the United States Fish and Wildlife Service and U.S. state agencies. The first Canadian course is planned for 1989.

Enforcement staff coordinated the control and clean up of several waterfowl disease outbreaks in 1988. Waterfowl mortalities associated with botulism (6500 ducks), avial cholera (5000 ducks), and necrotic enteritis (1500 ducks and geese) were dealt with throughout the Prairies.

Endangered Species Conservation

Whooping Crane Ecology and Rehabilitation

As part of the continuing efforts to conserve the endangered Whooping Crane, CWS carried out aerial surveys in 1988 to monitor cranes and their nests in and near Wood Buffalo National Park (WBNP). At least 31 nests are known to have been constructed in 1988. One pair of cranes failed to nest in 1988, although it did so in previous years.

Twelve live surplus eggs were shipped to Grays Lake National Wildlife Refuge in Idaho. Eleven eggs hatched, but due to the serious drought, only 2 young fledged and flew south with their foster parent Sandhill Cranes. Nine live eggs were also shipped to a captive rearing station in Maryland and all nine hatched.

Seventeen chicks were colour banded in the WBNP, area and 19 chicks including 3 unbanded chicks were known to have arrived on the winter range in Texas. One banded chick disappeared in Texas and another one appears to have been lost en route from WBNP.

At least eight whooping cranes are now missing after having arrived at Aransas National Wildlife Reserve (ANWR) on the Texas coast. About five additional subadults are at present unaccounted for: it is possible some of these may be wintering off ANWR.

As of 15 January, 1989, the world population of whooping cranes is about 200 birds, including 49 birds in captivity, 16 in the Idaho-New Mexico flock and about 135 in the WBNP-Texas flock.

Barren-ground Caribou, Beverly Herd

The intent of this study was to determine the effect of fire on the Beverly herd of barren-ground caribou in the Northwest Territories. Most of the research was conducted in drainages of the Snowdrift, Taltson and Abitau rivers. Data analysis from the five years of field work (1983-1987) is almost complete and a series of five reports containing the results of the study, as well as a summary containing final conclusions and recommendations, will be completed in 1989.

Beverly-Kaminuriak Caribou Management Board

Meetings were held at Stony Rapids and Winnipeg (two) during 1988. The long-awaited caribou management plan was distributed in July, 1988. Both herds are believed to be stable or decreasing in size. Above-average snowfalls in the last four winters may have reduced fat reserves and caused a dampening of earlier increases. The first commercial quotas on the two herds was approved in April, 1987, but few caribou were taken and sold within the NWT. The board sponsored the first school contests in northern Manitoba and awarded prizes for artwork and writing related to caribou and their management. A scholarship fund was established, which will be used by up to three students to further postsecondary education in resource management fields. The board is supporting studies that will assist fire managers in setting priorities in fire control operations.

Wood Bison Recovery Program

In 1986, an interjurisdictional steering committee, with representatives from Agriculture Canada, Environment Canada, (Canadian Parks Service and Canadian Wildlife Service), Alberta Agriculture, Alberta Forestry, Lands and Wildlife, Northwest Territories Renewable Resources, and Health and Welfare Canada was formed to examine the problems of diseased bison in and around Wood Buffalo National Park. The committee established a task force, which completed a report in November 1988 on the evaluation of brucellosis and tuberculosis in bison in northern Canada and identified possible options for dealing with the problem. On 7 February, 1989, the federal Minister of the Environment announced a five-member environmental assessment panel to deal with the problems of diseased bison. A cooperative newsletter, summarizing information about the disease issue, was released for distribution to the public on 20 February.

In April, 1988, the Committee on the Status Of Endangered Wildlife in Canada reclassified wood bison from "endangered" to "threatened", based on the information presented in the status report submitted by the wood bison recovery team. Total numbers of wood bison have steadily increased from less than 200 in 1959, to 450 in 1978, to more than 2500 in 1988.

A cooperative effort between CWS and the NWT Wildlife Service will relocate eleven adult female and three male wood bison from Moose Jaw Wild Animal Park to Nahanni Butte during early March. Release of these animals to the wild Nahanni population will double the number of breeding cows and increase the herd to more than 50.

Peary Caribou

Non-systematic aerial searches were carried out with a Bell-206B turbohelicopter in June 1988 to obtain data on springtime distributions, inter-island movements or migrations, temporal aspects of calving and sex/age composition of the Peary caribou on Bathurst Island. The five western satellite islands of Alexander, Massey, Little Cornwallis, Helena and Marc were systematically surveyed in July 1988, using a Bell-206B turbo-helicopter, employing an unbounded-line, transect-type survey design.

A revised draft status report on the Peary caribou" was completed in November 1988. A draft CWS project progress reporting the reevaluating numbers and distributions of Peary caribou in the Bathurst Island complex in 1988 is in process.

Polar Bear Ecology

Coordination of polar bear research and management through the Polar Bear Technical and Administrative Committees continued through the year.

Technical assistance and information were provided to the Inuvialuit Game Council, which was negotiating a management agreement with the Inupiat of the North Slope Borough (Alaska) for the management of polar bears in the southern Beaufort Sea. The agreement itself was signed in January, and in November the first meeting of the Technical Committee was held. A quota of 76, to be shared equally between Canada and Alaska, was agreed upon. Females with cubs and bears in dens are to be protected, and it was agreed there should be some emphasis on shifting the harvest to males whenever practical.

Entry of capture and kill data from CWS and NWT into the National Polar Bear Data Bank continued through the year with the total number of entries in the files now at about 21 000. These files provide the database for extensive views of harvest patterns and research topics that require long runs of baseline data. Data are available for all Canadian polar bear management zones.

In the fall of 1988, 308 polar bears were captured as part of a study of the age and sex-specific survival rates of polar bears and of the fidelity of adult females and female young to maternity denning areas. On average, bears were lighter than normal and we predicted this would result in an increased number of polar bears around the Churchill area, which later proved to be the case. In the spring, 41 adult females, including one lone female, and 73 cubs-of-the-year were tagged as well.

Observations of walruses, polar bears, and the Dundas polynya continued from mid-February to the middle of May. Five of the seven walruses branded there last year were resighted. Two more walruses were branded and had radios attached to their tusks. Bears were abundant in the area during the observation period. Over the past 10 years, there has been a steady increase in the size of the polynya in the spring, which might be a result of climatic change. This is causing some shifts in the distribution and possibly the abundance of polar bears and marine mammals using the area.

Piping Plovers

Breeding piping plovers were monitored at three lakes near Hanna, Alberta, where populations were relatively stable when compared with 1987 levels. Forty-two young were banded in 1988. Of the plovers banded in 1987 more than 80% of colour-banded adults and 2% of young birds were confirmed to have returned in 1988 to the Hanna area. Chemical analysis of eggs collected in 1987 indicated relatively clean levels.

The Prairie Piping Plover recovery team first met in October, 1988, and identified actions for recovery efforts.

Anatum Peregrine Falcon Recovery Project

In 1988 the Wainwright Captive Breeding Capacity produced 93 young for release at 12 sites in southern Canada. The peregrines are fed captive-bred quail at the rate of 60 000 per year. The number of wild Peregrine Falcons in southern Canada east of the Rockies increased to 31 territorial pairs and at least 10 other single peregrines. These falcons have reoccupied areas of Canada because of the captive breeding of falcons and their release in cities and from cliffs.

The Peregrine Falcon recovery team met in November in Halifax, Nova Scotia and recommended that a major survey for peregrines be conducted in 1990 to compare with surveys held every five years since 1970.

PACIFIC AND YUKON REGION

Migratory Birds Conservation

Waterfowl Breeding Pair Survey

The cooperative waterfowl breeding pair survey began in 1987 and continued over the same study area in 1988 with a new transect in the Cranbrook area. The survey involves the combined efforts of CWS, the British Columbia Wildlife Branch and Ducks Unlimited Canada. Population changes were detected in Mallard and Barrow's Goldeneye, as drying conditions prevailed through the fall and winter of 1987-88. The British Columbia Waterfowl Technical Committee met three times, once in conjunction with the Yukon Waterfowl Technical Committee. The B.C. Waterfowl Management Plan was completed and circulated to interested parties throughout the province. A survey of Trumpeter Swans wintering on Vancouver Island was completed, with the co-operation of the B.C. Wildlife Branch. A conceptual plan for a Pacific Waterfowl Joint Venture was drafted.

Yukon Waterfowl

In Yukon, CWS continued intensive monitoring of bird populations at important spring staging sites near Whitehorse using both ground-based counts and aerial surveys (with the assistance of Ducks Unlimited). CWS worked with Ducks Unlimited and the Yukon Department of Renewable Resources on a study of the Jarvis Creek wetland complex in southwest Yukon.

Surveys were conducted by CWS in the Kluane region of southwest Yukon to determine important staging, breeding and moulting sites for waterfowl. This project was supported by the Yukon Land Use Planning Directorate. A draft report entitled "An Assessment of Waterfowl Habitat and Distribution of Waterfowl in the Kluane Planning Region" was produced. CWS continued to coordinate the North American breeding bird survey for Yukon.

As part of the implementation of the Inuvialuit Final Agreement, attempts were made to continue the banding and monitoring of Pacific flyway Brant Ducks. Inclement weather and poor nesting success, however, resulted in very few tags being deployed.

Snow Geese Populations

Regional participation continued in the development of the Arctic Goose Joint Venture. Wrangle Island Lesser Snow Geese unfortunately eluded capture this fall, so the third year of banding had to be postponed. Visiting Soviet scientists assisted with preparations for banding, read neck collars and participated in discussions on joint management of the Wrangel Island geese. Collar sightings of geese marked previously on the Fraser delta and last summer on Wrangel Island were collected.

Snow Geese Behaviour and Habitat

Two intensive studies of Snow Goose biology are under way on the Fraser river delta. One examines their behaviour during the winter as it may affect survival of young birds and recruitment to the population. The other investigates habitat use in the Fraser and Skagit estuaries and covers the impact of geese in the Fraser estuary and, less frequently, the Skagit delta. A preliminary study on marsh plant growth patterns and variation was conducted and a summary completed. Other investigations on the historical abundance and distribution of Snow Geese, a comparison of different estimation techniques and assessment of harvest of Snow Geese on the Fraser river delta during 1982-83, 1983-84 and 1986-87 are being pursued.

Marine Birds

The final draft of proceedings of a symposium on the ecology and status of marine and shoreline birds in the Strait of Georgia was completed this fiscal year. Publication is anticipated as a CWS special report in early 1989-90. The proceedings combine various disciplines and provide an overview of what is at present known about the marine biology of the Strait of Georgia ecosystem. Particular emphasis is paid to marine birds. Important gaps in knowledge in different fields are identified, and suggestions are made how to remedy insufficiencies. The overview will be an important reference for educators and biologists, as well as for researchers, field workers and managers in resource management.

Seabirds

The seabird colony inventory of British Columbia was completed with the census of seabird colonies along the mainland coast. Two technical reports on the survey results are completed and several more are in progress.

Completion of the inventory enables CWS to formulate seabird management plans with cooperators such as Canadian Parks Service and B.C. Ministry of Environment. Discussions and preliminary assessments were made concerning seabird management in South Moresby National Park Reserve and impacts and controls of introduced mammalian predators in the Queen Charlotte Islands.

Aquaculture

Final reports on a study of the relationships between aquaculture and marine birds in southern B.C. will be completed in the summer 1989. The study, in progress over the past year, has looked at conflicts and overlaps of marine birds and finfish aquaculture and mechanisms for reducing conflicts. Potential displacement of wintering and breeding birds was also investigated. Data on aquaculture and bird distribution were analysed using the SPANS GIS system.

Great Blue Heron Population Studies

Because of the concerns over widespread dioxin contamination of wildlife and the environment, P&Y has studied the population ecology of the Great Blue Heron to determine whether high contamination is negatively affecting the species and whether this is useful as a general indicator of environmental health. We have found that there is a higher failure in small colonies than large colonies and contaminants may be part of the answer. Natural mortality in clean colonies is highest during the early nestling and postfledgling stages. However contaminated colonies suffer highest mortality during the egg stage. In addition the results indicate that herons nest near abundant food sources usually away from the estuaries where most herons spend the winter. Contaminant loads in eggs may indicate pollution levels in the wintering sites (i.e. estuaries), some of which support internationally significant migratory bird populations.

Birds of British Columbia

The most recent comprehensive treatment of the bird fauna of British Columbia was in 1974 when *A Review of the Bird Fauna of British Columbia*, by J.A. Munro and Ian McTaggart-Cowan, was issued. Since that time, there have been many studies on the birds of the province and their habitat, which have resulted in new information on aspects of the natural history of many species and in extensions or reductions of their known distribution. In addition, over the past 40 years many changes have occurred to bird habitat through industrial and agricultural practices and urbanization, which have affected the birds and their distribution within the province. The Royal British Columbia Museum, British Columbia Wildlife Branch, and CWS have been working cooperatively to bring together all existing information on the birds of British Columbia, to review and synthesize that information and to complete species accounts and distribution maps on the 400-plus species of birds known to occur or have occurred in the province.

In 1988, the manuscript for the non-passerine volume was completed and arrangements for its publication finalized. In addition, first draft maps were completed for all passerine species in volume two. The first volume, *Birds of British Columbia Non-Passerines*, will be published in summer 1989.

Creston Office Opens

Malcolm Dennington from our Whitehorse operation moved to Creston to open up a new CWS office. He began work by carrying out waterfowl breeding pairs surveys in the Cranbrook area. He is also linking closely with the Creston Valley Wildlife Management Area Authority to investigate waterfowl population dynamics. The Creston office will also deal with habitat, national wildlife area management and transboundary wildlife issues.

Regulation and Enforcement

The Regulations and Enforcement Section completed a six-month project into CITES enforcement problems in Pacific & Yukon region. A number of problems were identified and a report of the project will be available next year.

Enforcement personnel participated in National Police Week for the second year in a row. Interest was exceptional in our wildlife displays.

With the loss of MCC/CSA section of the RCMP, training originally planned was modified.

Enforcement staff responded to urban geese complaints. The nesting season brought numerous complaints of geese nesting on top of buildings in the downtown core.

Hunting seasons were normal with odd exceptions. A new twist this year was the use of high-speed boats to hunt geese.

The Regulations and Enforcement Section is computerizing. We have received access to provincial wildlife offender files, which will assist in closer cooperation between the agencies and cross reference between waterfowl and big-game offenders.

Wildlife Research and Conservation

Yukon Caribou

CWS coordinated two projects on the Porcupine caribou herd. The body condition of the herd is being investigated jointly with the University of Alaska, Fairbanks. Collections of individuals in the herd will determine what factors must be considered for a routine monitoring program. The use of computer models to collate information and help guide future research were further developed in this fiscal year. Three models related to the energetics and population dynamics of the herd were documented.

Habitat Management and Assessment

Habitat protection activities in B.C. concentrated on influencing land-use policies and programs of federal and provincial agencies. Advice on the habitat requirements of migratory birds was provided in several joint federal-provincial land-use planning schemes, including the Fraser, the Squamish and the Cowichan river estuary management plans, and by responding to more than 200 interagency land-use referrals. Active participation in Environment Canada RSCC task forces providing input to EARP panel projects was also continue.

We continued monitoring habitat rehabilitation projects at the Campbell, Cowichan, and Englishman river estuaries. Habitat management was promoted by ongoing operations of migratory bird sanctuaries and national wildlife areas, by reviewing and revising management plans for MBSs and NWAs and by participating on the federal-provincial Pacific Estuary Advisory Team, a sub-group of the Pacific Estuary Conservation Program.

Wetlands

Two contracts were initiated in 1988-89 to study wetland habitats. The first was a follow-up to "Wetlands Are not Wastelands" workshops in developing methods to demonstrate the desirability of wetland retention. The Cowichan Estuary Pilot Project assessed three methods of wetland evaluation in two phases. The first phase inventoried the current functions of the Cowichan estuary and any proposed changes, and developments that might affect wetland functions. The second phase tested the

three methods for ease of implementation, quality and credibility of the results and recommended possible improvements in methodology. This is one of several pilot projects across Canada, the final objective being to assert the economic values of wetlands.

The second contract inventoried the remaining wetlands in the Fraser lowland using aerial photographs and the Canadian Wetland Classification System (CWCS). The data collected and stored on a dBase file include: wetland identification number; area in hectares; air photo reference number; and class, form and type according to the CWCS. In addition, the file of georeferenced polygon information was prepared for conversion to SPANS GIS files where computer modelling and analysis can be conducted. This contract was in preparation for a second phase (planned for summer 1989) involving field checking to verify the results from Phase 1 and to select and assign a rating scheme to evaluate wetlands for their habitat value. The SPANS files would then be updated. There are plans to also incorporate the results from a detailed inventory being conducted by Fraser Estuary Management Plan (FREMP) staff expected to be concluded in 1989-90. This combined database will be invaluable in planning for wetland habitat preservation amidst the extreme developmental pressures from both urban and agricultural uses in this area.

Land-Use Change Studies

Preliminary analysis was conducted on land-use change data collected for 1981 and 1986 for Vancouver and Victoria. These databases were originally stored at the Environmental Information Systems Division, CWS headquarters, but have since been downloaded to the SPANS microcomputer. In addition to these two databases, we now have the entire Chilliwack-Vancouver land-use database. The latter data will be analysed; results are expected to be published in a fact sheet in 1989-90. This database will also be used in conjunction with the inventory from the wetlands of the Fraser lowland in studying wetland preservation and developmental pressures.

SPANS Geographic Information System

This region acquired a GIS work station early in 1988/89. Recent hardware additions to the station include a digitizing tablet (for inputting maps into the system) and a colour printer. Three staff members and one contractor were trained on the SPANS system during the year, and it is planned that other staff members will acquire at least a working knowledge of the GIS.

Attendance at a GIS conference in March indicated that GIS technology is continuing to evolve rapidly and that the number of agencies recognizing their need for a microcomputer-based GIS has grown substantially even within the last year. For instance, there are plans to link georeferenced databases on a variety of incompatible national and provincial agency systems via GISs in ICOIN (Inland Waters, Coastal and Ocean Information Network). A preliminary list of this region's databases and their authors has been forwarded to the individuals coordinating the development of this network. Such networks could foster cooperation among agencies at all levels.

Two projects conducted in 1988-89 were altered in methodology to create databases compatible with SPANS. In addition, some projects will be incorporating SPANS directly into their methodologies. Increasing familiarity with SPANS and GIS databases will promote the application of SPANS as another research tool.

Environmental Emergencies

CWS played a major role in the clean-up of oil on Vancouver Island resulting from the "Nestuca" accident. Oiled-bird cleaning equipment was provided to a volunteer group in Ucluelet. Guidance and advice was provided to oiled-bird cleaning volunteers in Tofino during start up of the operation. Biological and technical expertise was provided daily for six weeks to the regional environment emergency team at Ucluelet. During assessment of resources at risk, CWS consistently lead the way in locating oil-contaminated habitats. Birds washed ashore were identified and tallied. Follow-up impact-assessment studies were designed.

Toxic Chemicals

Dioxins in Great Blue Herons continue to be the paramount issue in the region's toxic chemicals program. The presence of elevated levels of dioxins in heron eggs collected from several colonies on the Strait of Georgia between 1982 and 1988, and the failure of the most heavily contaminated colony to raise any young for the past two years, has been widely publicized. Interest in the issue remains high. This year we will continue to assess the productivity of heron colonies in relation to dioxin level. Particular attention will be given to the response of incubating adult herons to disturbance and the role of predation in the loss of eggs. Cormorants and diving ducks will be surveyed for residues to determine how widespread dioxin contamination in the strait has become. Studies of the development of heron embryos in relation to dioxin level, which were completed last year, will be published. Eggs from several seabird colonies on the west coast will be collected for toxic-chemical screening.

Communications

Regional staff were busy promoting the CWS and environmental conservation. In addition to numerous public speeches and radio and television shows, we co-hosted the Delta Snow Goose Festival and participated in environment and police week activities. Regional staff also contributed to the production of a video on Pacific estuaries.